CURRENT AFFAIRS

March 22, 2022

STAGFLATION? NOT IN THE US, BUT EUROPE IS AT RISK!

Stubborn Inflation, Surging Commodity Prices, and Risk of Recession

- **Inflation is still the dominant risk, while recession fears are also back.** Inflation has proven to be far more stubborn than most central banks are willing to admit. While most of the world is still grappling with supply chain disruptions, the Russia/Ukraine conflicts and the resulting price spikes in crude oil, natural gas, and other commodities have made the job of central banks even more complicated. Google Trends suggest that the fear of recession has come back, while the awareness of stagflation has reached its all-time high.
- **Recession Prediction.** We zoom into recession forecasting, by testing over 50,000 macro variables in our global macro database, using sophisticated quantitative models. In most countries, the yield curve (level, slope, and curvature), economic policy, signals derived from the equity, bond, and commodities markets, geopolitical risk, anticipated growth (from our Nowcasting models), and inflation are predictive of future recessions. We also find that the relationship between a given macro variable and future recession varies considerably by countries.
- **Recession Risk in the US, Europe, and Japan.** Using about a dozen representative indicators, from five categories (yield curve and policy, growth and growth expectations, inflation and commodities, equity and bond markets, and global economic and geopolitical risk), we attempt to quantify the near-term recession risk in three major economies – the US, Europe (proxied by Germany), and Japan. While economic fundamentals remain strong in most parts of the World (especially in the US), surging inflation, commodity supply disruption (and the resulting price spikes), and heightened geopolitical risk have increased the recession risk significantly in recent weeks in Europe. Recession risk is low in the US, modest in Japan, but at an alarming level in Europe.
- **Asset Allocation with Inflation (and Possibly Recession).** In the current economic environment, i.e., high inflation but nonnegligible risk of stagflation, we would like to recommend the RISE and the SHIELD strategies to asset allocation framework. Adding the two strategies to major asset classes (using a risk parity allocation) more than doubles long-term Sharpe ratio and reduces downside risk by over one-third, compared to a passive benchmark. The RISE provides strong inflation hedges, while the SHIELD protects us again recessions.

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SUSTAINED INFLATION AND RENEWED WORRY ON RECESSION

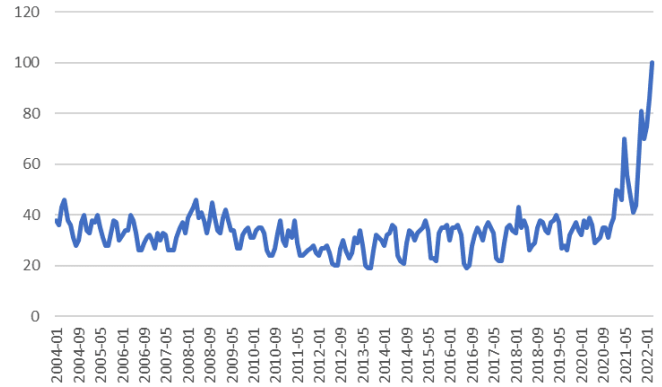
While most of the world is still fighting for the stubborn inflation, the Russia/Ukraine conflicts and the resulting price spikes in crude oil, natural gas, and other commodities have made the job of central banks more complicated. The surging commodity price, especially crude oil, reminds us of the recessions in the 1970s and 1980s caused by the oil crisis at the time.

Inflation is Setting a New Record

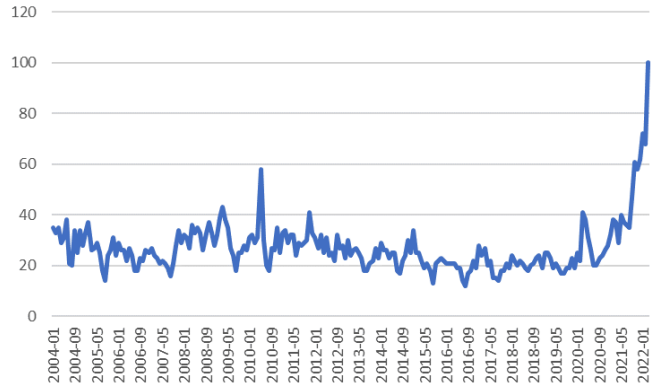
As detailed in *The Trio Dynamics*, inflation has clearly been the dominant concern for investors in the past two years, as reflected in the record levels based on Google Trends (see Figure 1A and B). Inflation has proven to be far more persistent than policymakers had hoped for, due to a combination of strong demand and supply disruption. As shown in Figure 1(C) and (D), our Inflation Nowcasting index is close to its all-time highs in the US and at its all-time high in Europe.

Figure 1 Inflation

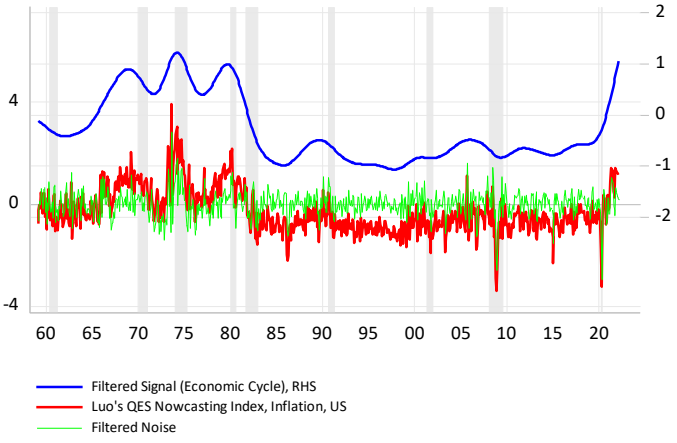
A) "Inflation" Google Trends, US



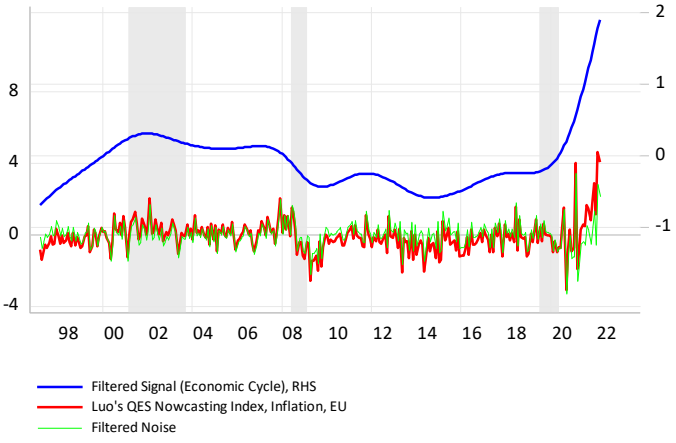
B) "Inflation" Google Trends, Germany



C) Inflation Nowcasting, US



D) Inflation Nowcasting, Europe



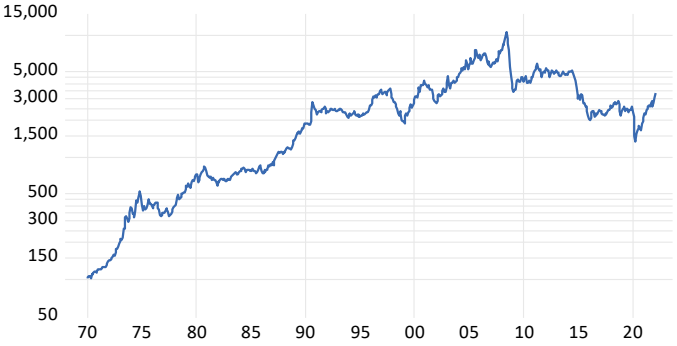
Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

Commodity Prices Continue to Surge

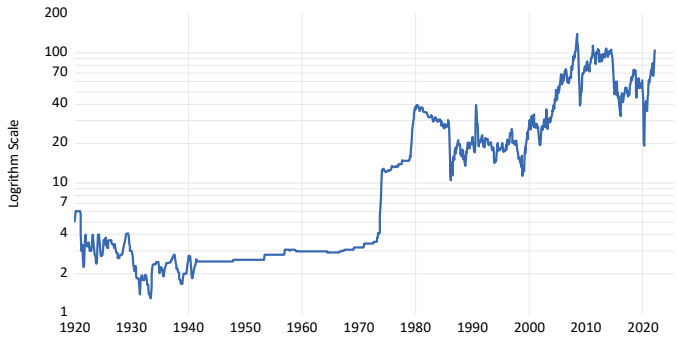
The surging commodity prices, especially crude oil and natural gas – as a result of the Russia/Ukraine conflict – further complicates Fed policies (see Figure 2A and B). The global geopolitical risk has reached the levels last seen in September 11 terrorist attack (see Figure 2C). For Russia and Ukraine, geopolitical risk has far exceeded its previous peaks (see Figure 2D). As the war drags on, commodities face continued severe supply disruption, which further complicates inflation expectations.

Figure 2 Commodity Prices and Geopolitical Risk

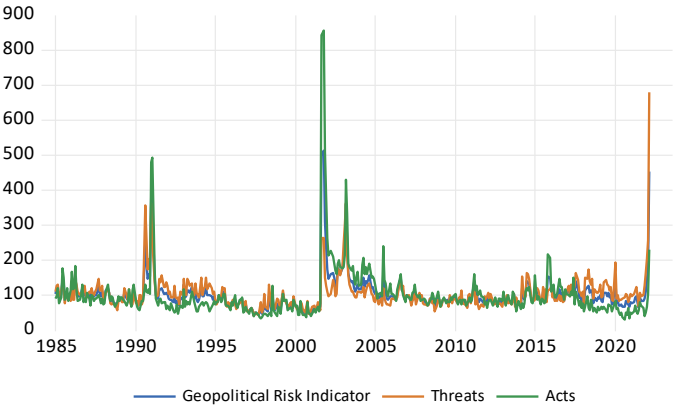
A) Commodity Price (S&P GSCI Total Return Index)



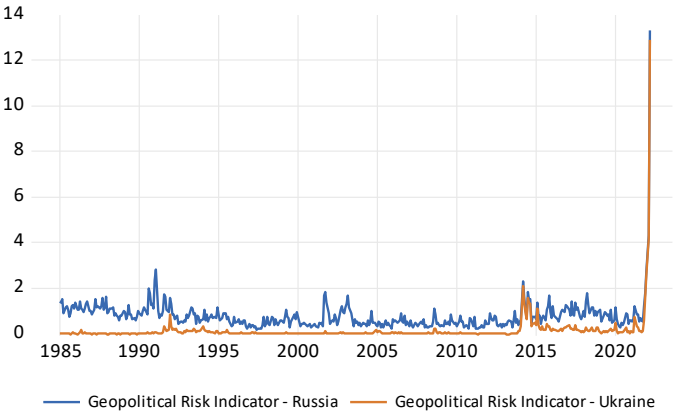
B) WTI Crude Oil



C) Global Geopolitical Risk Index



D) Geopolitical Risk Index, Russia and Ukraine



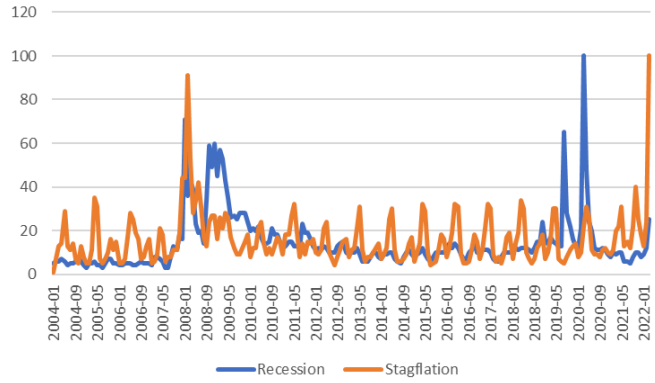
Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

The Risk of Recession and Stagflation

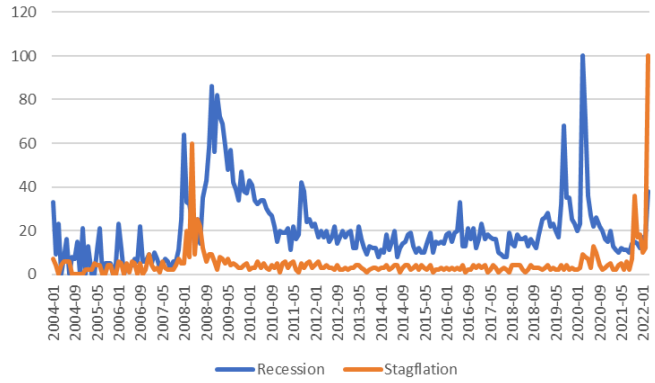
The sharp spike in commodities prices, especially crude oil, has triggered recession worries again. As shown in Figure 3(A), the recession fear index – based on the keyword search of "recession" using Google Trends – is creeping up in the US and even more so in Germany (see Figure 3B). Moreover, Google Trends for "stagflation" has just reached its all-time high in both countries.

Figure 3 Recession and Stagflation Fears

A) Google Trends "Recession" and "Stagflation", US



B) "Recession" and "Stagflation", Germany

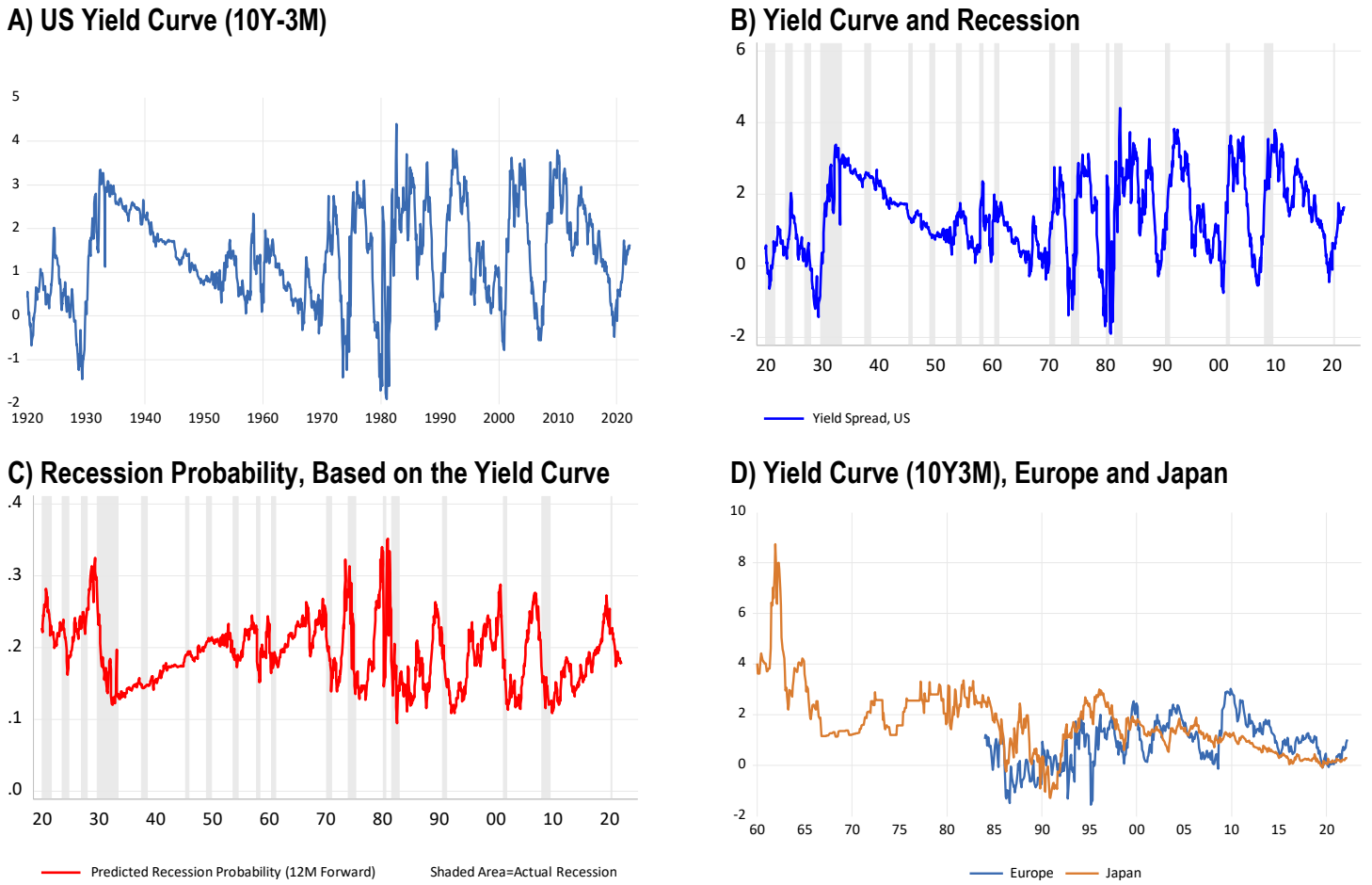


Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

The Relationship between Oil Crisis, Yield Curve, and Recessions

As detailed in *Tug-of-War* and *Factor Patterns in a Late-Stage, High Uncertainty, Fed Easing Cycle*, inverted yield curve is highly predictive of near-term recessions. As shown in Figure 4(A), the US treasury yield curve – measured by the spread between the 10-year and 3-month treasury yield is fortunately still highly positive, indicating a normal upward sloping yield curve. Historically, every single recession was preceded by the inversion of the yield curve since late 1950s (see Figure 4B). Based on the yield curve alone, the recession probability is below 20%, still a small probability event (see Figure 4C). The yield spread is flat in Japan and remains upward sloping in Europe (see Figure 4D).

Figure 4 Inverted Yield Curve and Recession Risk



Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

As shown in Figure 5(A), WTI has surged sharply since the start of the Russia/Ukraine war. Currently, WTI is close to its all-time highs. The 1973-1975 recession was clearly preceded by a spike in oil prices, due to the oil embargo (see Figure 5B). Similarly, another rally in oil price in 1978-1979 was followed by the short recession in 1980. This is one of the arguments that some investors are making – the current sharp increase in oil prices is likely to trigger another recession. Historically, however, there are periods of surges in oil prices that did not lead to immediate recessions (e.g., 2004) and similarly, there are many recessions without a preceding oil crisis (e.g., 2008-2009 GFC).

Due to the low variations in oil price prior to early 1970s, we decide to focus our analysis from 1973, using a simple logistic regression:

$$logit(P_{t+3}) = \beta_0 + \beta_1 r_{WTI,t} + \varepsilon_t$$

Where,

$logit(P_{t+3})$ is the logit of P (probability of a recession) at time $t + 3$ (i.e., three months from now),

$r_{WTI,t}$ is the year-over-year return of WTI at time t,

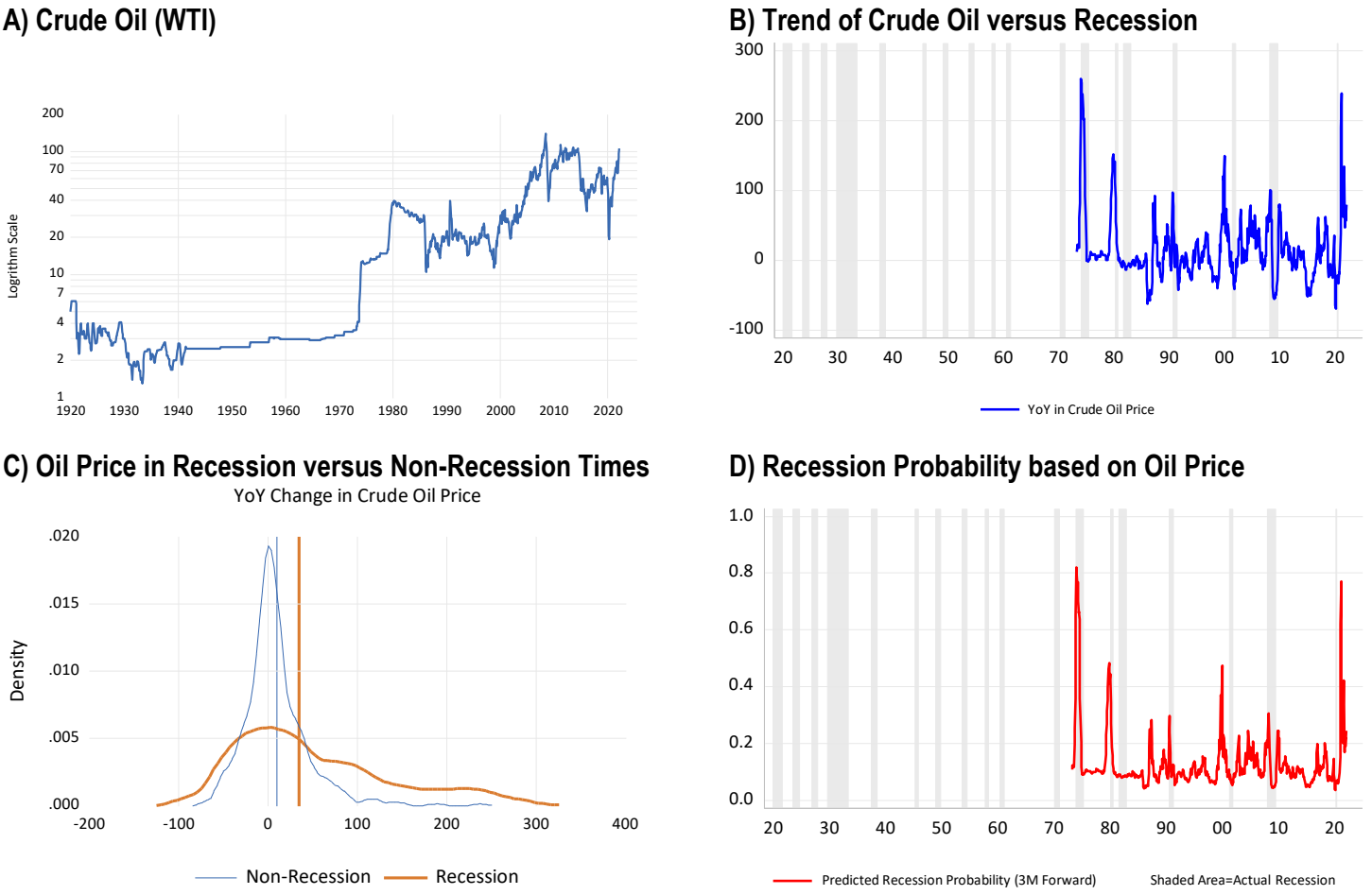
β_0 and β_1 are coefficients (to be estimated), and

ε_t is the residual error term at time t.

If we set our target variable as the $1/0$ indicator (where 1 indicates a recession at month t) for recession three months from now, we can estimate the above equation using logistic regression. The z-statistic (which closely mirrors the t-statistic in an OLS regression) and the associated p-value can then be used to make statistical inference on whether a given exogenous variable (e.g., monthly WTI return) is predictive of recession in the next quarter.

Using data from 1973 until present, YoY change in WTI is highly predictive of future recessions (at a three-month horizon). The estimated $\widehat{\beta_1} = 0.015$ is statistically significant at above 99%.

Figure 5 Crude Oil versus Recession Risk



Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

Given that the yield spread is also highly predictive of near-term recessions, we need to add it as a control variable, so the revised regression is:

$$logit(P_{t+3}) = \beta_0 + \beta_1 r_{WTI,t} + \beta_2 YieldSpread_t + \varepsilon_t$$

Where,

$YieldSpread_t$ is the yield spread (10Y-3M) at time t,

The estimated equation is as follows:

$$logit(P_{t+3}) = -2.086 + 0.014 r_{WTI,t} - 0.122 YieldSpread_t$$

Therefore, controlling for the yield spread, oil price is still predictive of future recessions. The estimate coefficient is almost the same as before.

We further hypothesize that extreme spikes in oil price are more predictive of future recessions. To test this hypothesis, we create an indicator variable $Ind_{ExtremeWTI,t}$:

$$Ind_{ExtremeWTI,t} = \begin{cases} 1, if\ YoY\ oil\ return\ is\ above\ 90\%\ percentile \\ 0, otherwise \end{cases}$$

Basically, $Ind_{ExtremeWTI,t}$ indicates those months when YoY change in crude oil prices is above its 90% percentile (currently, it is about 63%). Then, we add the indicator variable to our logistic regression:

$$logit(P_{t+3}) = \beta_0 + \beta_1 r_{WTI,t} + \beta_2 YieldSpread_t + \beta_3 Ind_{ExtremeWTI,t} + \varepsilon_t$$

Where,

Using the above modified equation, all three variables are still highly significant (with p-values all less than 1%). $\widehat{\beta_1} = 0.007$ becomes smaller (yet still statistically significant), $\widehat{\beta_2} = -0.134$, and $\widehat{\beta_3} = 1.080$. The positive coefficient on $Ind_{ExtremeWTI,t}$ confirms our intuition that extreme surges in oil prices exacerbate recession risk.

THE HISTORY OF WORLD RECESSIONS

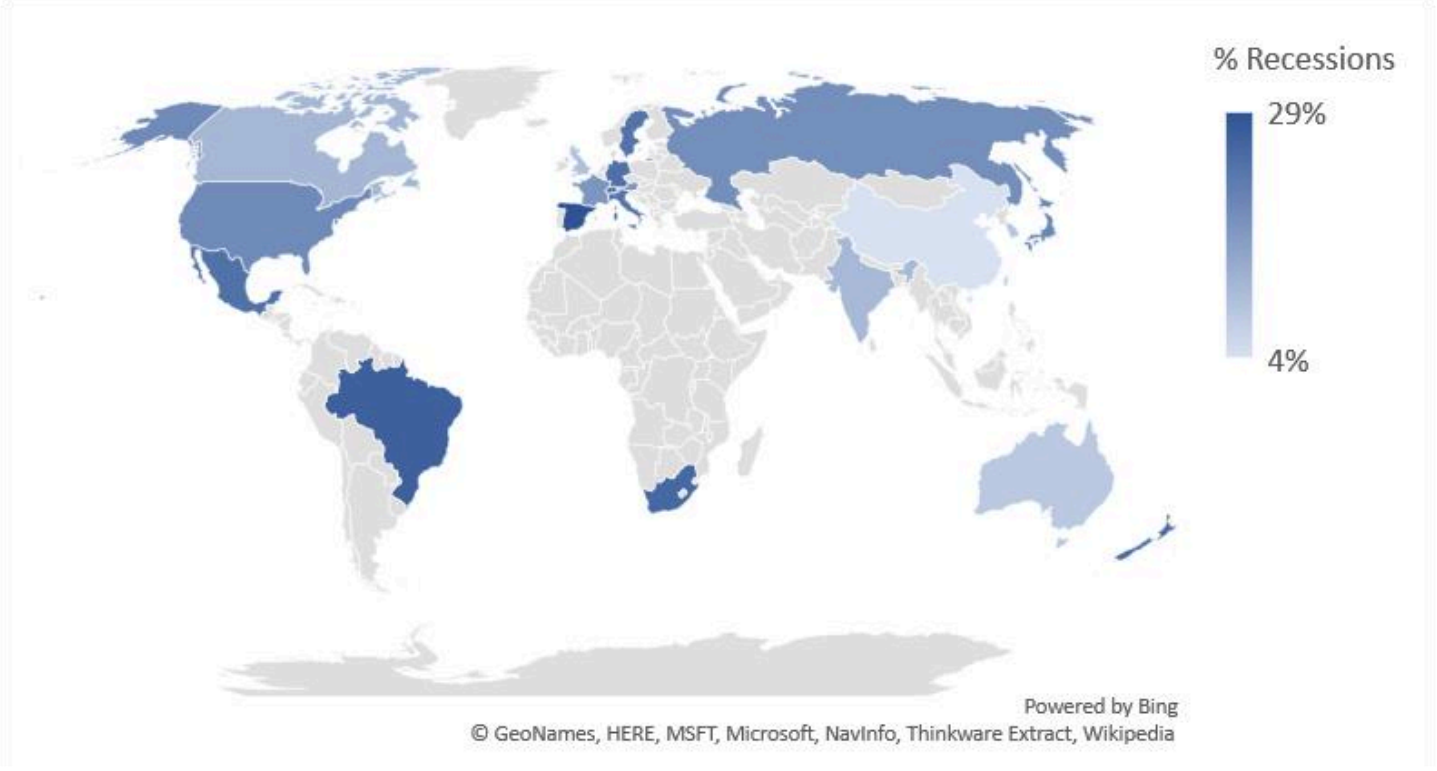
In this research, we collect recession data from 22 countries and regions (see Figure 6), including most of the largest economies of the world, e.g., US, China, Japan, Germany, UK, France, Canada, India, and Russia.

While the conventional wisdom suggests that two consecutive quarters of negative GPD growth would qualify a recession, the NBER (National Bureau of Economic Research) – the official entity that defines recession – uses a much more comprehensive set of criteria. Specifically, NBER defines a recession as "a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales" (see NBER [2008]).

In most other countries, there is no similar official definition of business cycles. In this research, we use the ECRI (Economic Cycle Research Institute) definition. ECRI determines recessions and expansions for international economies using the same methodology used by the NBER in establishing official business cycle dates for the US.

Our US recession data starts from 1919, while recession record starts in 1950s/1960s in most other countries. As shown in Figure 6, the percentage of months in recessions varies greatly by countries. On the one extreme, Spain, Brazil, and South Africa suffer from recessions over a quarter of the time. On the other end, China, Taiwan, and Australia have enjoyed more smooth reported economic growth in recent history.

Figure 6 Percentage of Months in Recession, 22 Countries



Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

RECESSION PREDICTION

Recession forecasting should be of tremendous interest to the general public, policymakers, and investors. However, surprisingly, there is scant coverage of this topic in academic literature. While the predictive power of yield curve in recession forecasting is beyond dispute (see *JQES: The Predictive Power of the Yield Curve – A Literature Review* and Estrella and Hardouvelis [1991]), few other variables are being suggested as useful predictors. Erdogan, et al [2015] find that equity market liquidity provides additional insights beyond the yield curve. Guirguis [2019] suggests that the Fed Funds Rates and money supply (M2) can be added to the model. Huang and Startz [2018] argue that stock market volatility also contains useful information about future recessions. In a broader context, McMillan [2018] finds that variables derived from the equity market can be predictive of future economic activities. Most existing research is exclusively on US recessions. Carstensen, et al [2017] and Aastveit, et al [2017] are a few exceptions.

CHALLENGES IN RECESSION MODELING

The biggest challenge in recession forecast is that we have few actual observed recessions. Therefore, it falls into the domain of rare event prediction. The extremely small sample size poses significant difficulties on statistical inference. While the so-called data snooping bias is nearly impossible to avoid in economic and financial research, it is especially problematic in rare event predictions. Because the number of potential variables is much larger than the number of actual recessions, many factors may appear to be statistically significant, when in fact there is no real causal relationship.

The second significant complication in recession modeling is that the dating of recessions suffers from considerable delays. In the US, the NBER typically announces the start and ending dates of business cycles between six and 21 months post the actual events. For example, for the 2008-2009 GFC, NBER determined the peak of the cycle (i.e., the starting of a contraction) on December 1, 2008 – almost one year after the actual beginning (December 2007). Similarly, the NBER cited the end of the recession on September 20, 2010, about 15 months post the term of the recession (June 2009). In other words, the event dates are not point-in-time. We need to forecast the "present" before we can predict the future. In *From Nowcasting to Forecasting*, we provide in-depth discussion on economic Nowcasting and how our suite of Nowcasting indices can help investors make real-time decisions.

Lastly but probably also the most problematic issue is that the predicted recession probability is extremely sensitive to the factors used in the model. Even just adding or subtracting a single variable can change the forecast dramatically.

In this research, we start from a list of major economic, geopolitical, and market variables in our global macro database. We want to understand what factors are predictive of a forthcoming recession three months ahead.

US

In this section, we discuss a few important macro variables that are predictive of US recessions in the following three months. We divide the potential predictors into the following categories:

- Yield curve and economic policy
- Growth and growth expectations
- Inflation and commodities

- Equity and bond markets
- Global economic and geopolitical risk

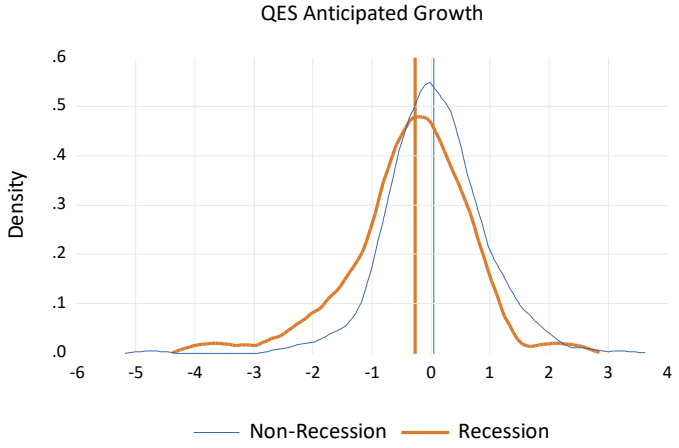
Anticipated Growth Nowcasting

In the paper *From Nowcasting to Forecasting*, we detail the methodology behind our Nowcasting research. As a reminder, for each major country/region, we produce four Nowcasting indices – growth, anticipated growth, inflation, and employment – to measure the four major dimensions of the economy. The anticipated growth Nowcasting mainly uses survey-based "soft" data to assess the real-time expectations from economic agents.

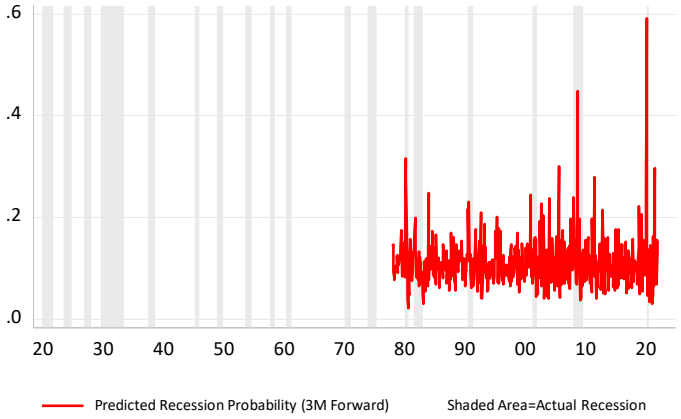
As shown in Figure 7(A), the distribution of the anticipated growth rate is materially different between non-recession and recession regimes. Specifically, in recession times, the anticipated growth rate tends to be much lower. As a result, the predicted recession probability spikes a few months before the onset of every recession since 1980s (see Figure 7B). Currently, the anticipated growth has slowed down somewhat, but remains robust by historical standard, pointing to a low (at 15%) recession probability in the next three months.

Figure 7 Anticipated Economic Growth and Recession Prediction

A) Distribution in Non-Recession vs Recession Regimes



B) Predicted vs Actual Recession



Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

Inflation, Recession, and Stagflation

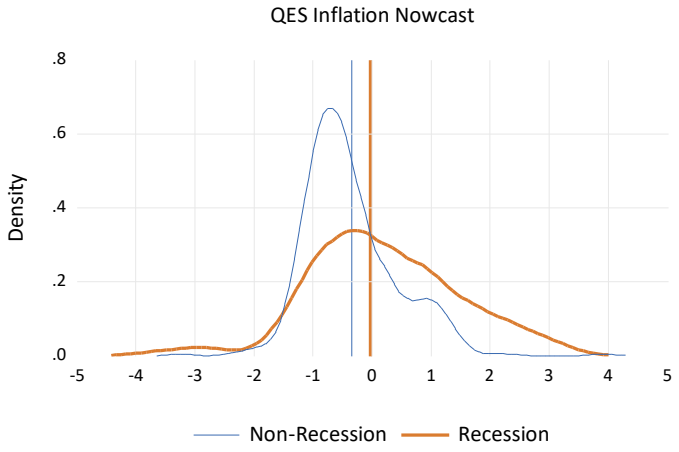
Although economic theory generally suggests that inflation and economic growth do not normally co-exist. When the economy is booming, demands for goods and services are strong, which typically lead to inflation. Similarly, in recessions, inflation is generally low (or even outright deflation). However, there are recession periods marked with high inflation, i.e., the stagflation era in the 1970s.

Using the entire history from 1919 to present, CPI inflation is highly predictive of future recession, with a negative sign, which means that low inflation tends to be associated with near-term recession. The relationship changed drastically during the 1970s stagflation period, which was marked by high inflation and sluggish growth. Since 1980s, the relationship between inflation and recession has largely broken down – inflation by itself has not predictive power of future recession. The above analysis clearly highlights the time-varying nature of economic relationship and the danger of time series modeling.

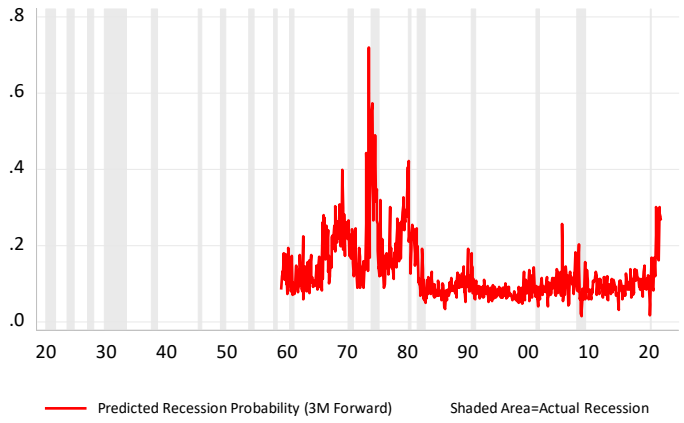
As shown in Figure 8(A), using data from 1958 to present, our QES Inflation Nowcasting Index is materially higher during recession periods than normal time. As a result, the current high inflation hints at some modest recession risk (see Figure 8B).

Figure 8 Inflation (QES Inflation Nowcasting Index) and Recession Prediction

A) Distribution in Non-Recession vs Recession Regimes



B) Predicted vs Actual Recession



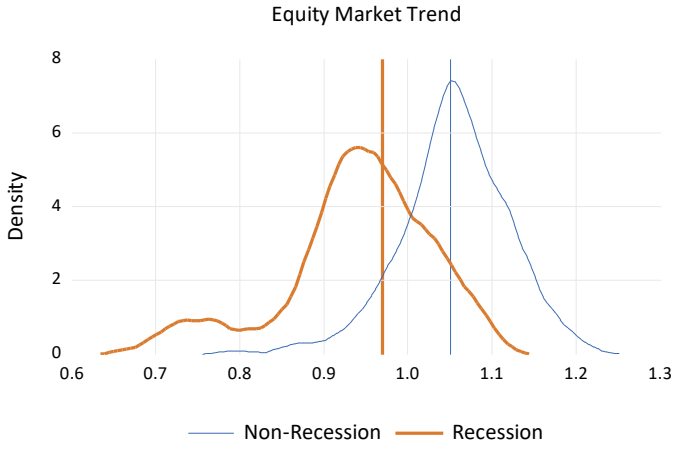
Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

Warning Signs from the Equity and Bond Markets

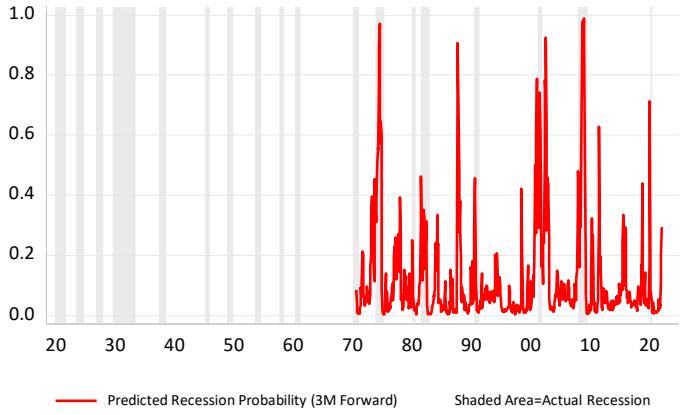
We have long been arguing that signals from the equity market can be useful in macroeconomic forecasting (see *Synthesizing Aggregate Sector, Industry, and Country Factors*). As shown in Figure 9(A), the equity market typically plunges before a recession takes place. However, the equity market often crashes without fundamental economic reasons; therefore, it triggers occasional false alarms (see Figure 9B). The recent weaknesses and volatility suggest some modest recession risk.

Figure 9 The Trend of the Equity Market and Recession Prediction

A) US Equity Trend



B) Predicted vs Actual Recession

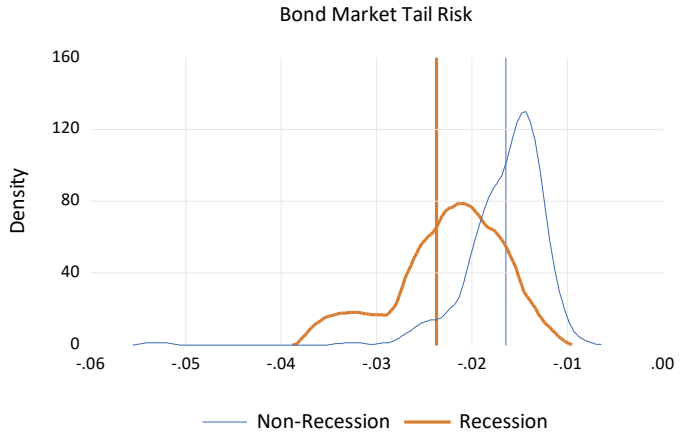


Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

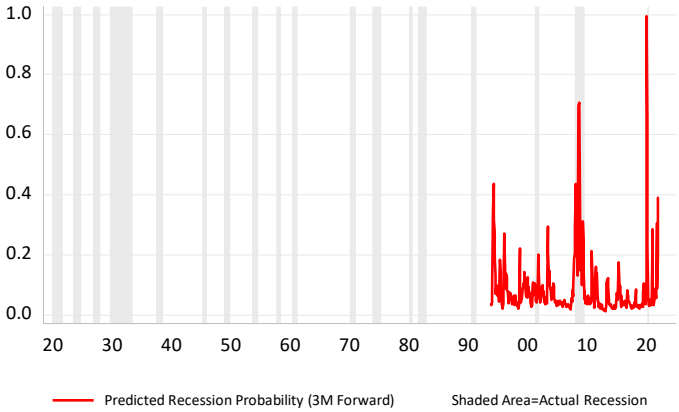
Relative to equity managers, bond investors tend to pay more attention to information from the yield curve and care more about inflation and recessions. Therefore, information from the fixed income market can also be highly informative of future economic conditions. One unique signal derived from the bond market is our global bond tail risk factor, based on a sophisticated multi-asset risk model[1]. As shown in Figure 10(A), bond market tail risk spikes during recessions, despite its limited history. Given the recent volatility in the fixed income market, it is not surprising to see that the bond market is sending a warning signal for forthcoming recession (see Figure 9B).

Figure 10 Bond Market Tail Risk and Recession Prediction

A) Bond Market Tail Risk



B) Predicted vs Actual Recession



Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

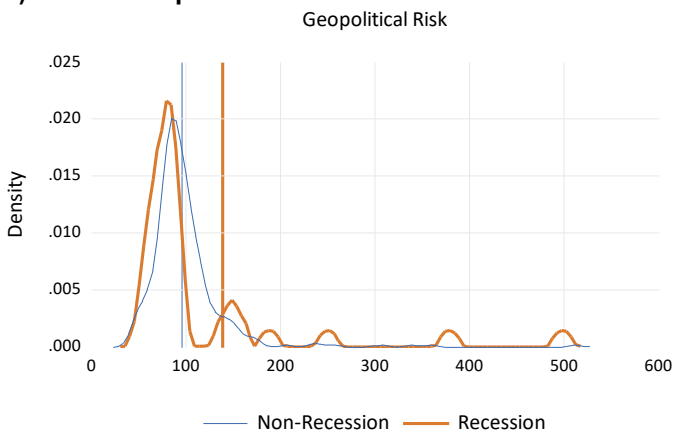
Geopolitical Risk

As mentioned in earlier sections, global geopolitical risk has surged in recent weeks, due to the Russia/Ukraine war and the associated sanctions imposed by many nations. Historically, major geopolitical events such as wars were among the triggers of recessions. As shown in Figure 12(A), spikes in geopolitical risk recedes recessions by three months. However, we have to keep in mind that the data history of the geopolitical risk index is relative short (from late 1980s) and there are many outliers. If the war between Russia and Ukraine further intensifies or drags longer than the market is anticipating, recession risk will also rise (see Figure 12B).

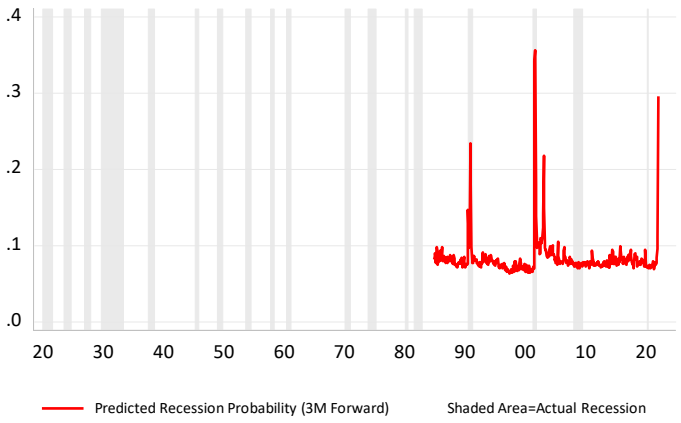
[1] Technically, it is based on a multivariate GARCH, DCC (Dynamic Conditional Correlation), and copula model.

Figure 11 Geopolitical Risk and Recession Prediction

A) Global Geopolitical Risk



B) Predicted vs Actual Recession



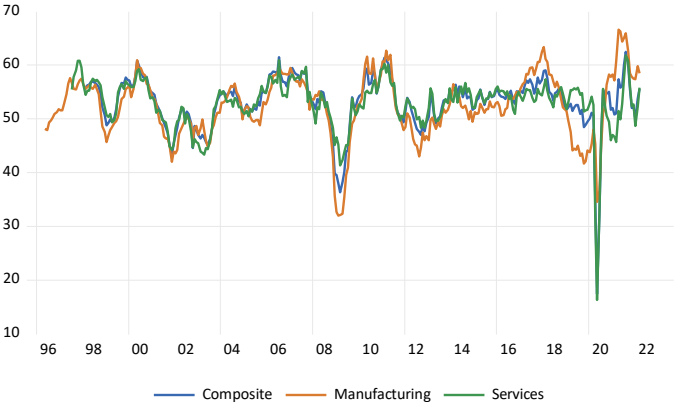
Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

GERMANY

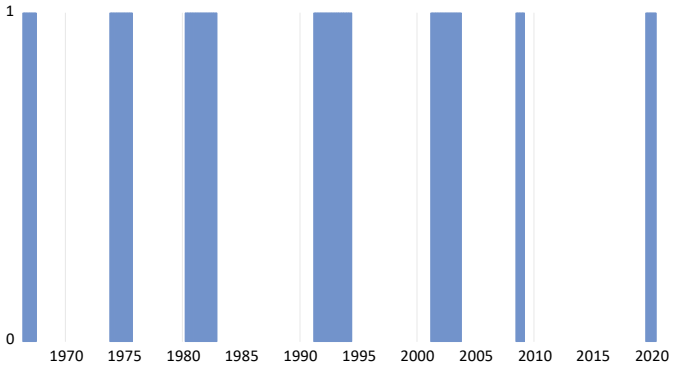
The state of the German economy is not only critical to Germany itself, but also serves as a barometer for Europe and the rest of the world (see *Challenges and Opportunities in European Equities*). As the largest economy in Europe, Germany has gone from being the powerhouse of the region to one of the first showing weaknesses, dragged down by surging commodity prices (especially crude oil and natural gas) and the uncertainty surrounding the Russia/Ukraine war. As shown in Figure 12(A), Germany's PMIs remain strong, but manufacturing PMI starts to show signs of weaknesses. Since 1966, there have been seven recessions in Germany defined by ECRI (see Figure 12B).

Figure 12 The State of the German Economy

A) German PMI



B) German Recessions

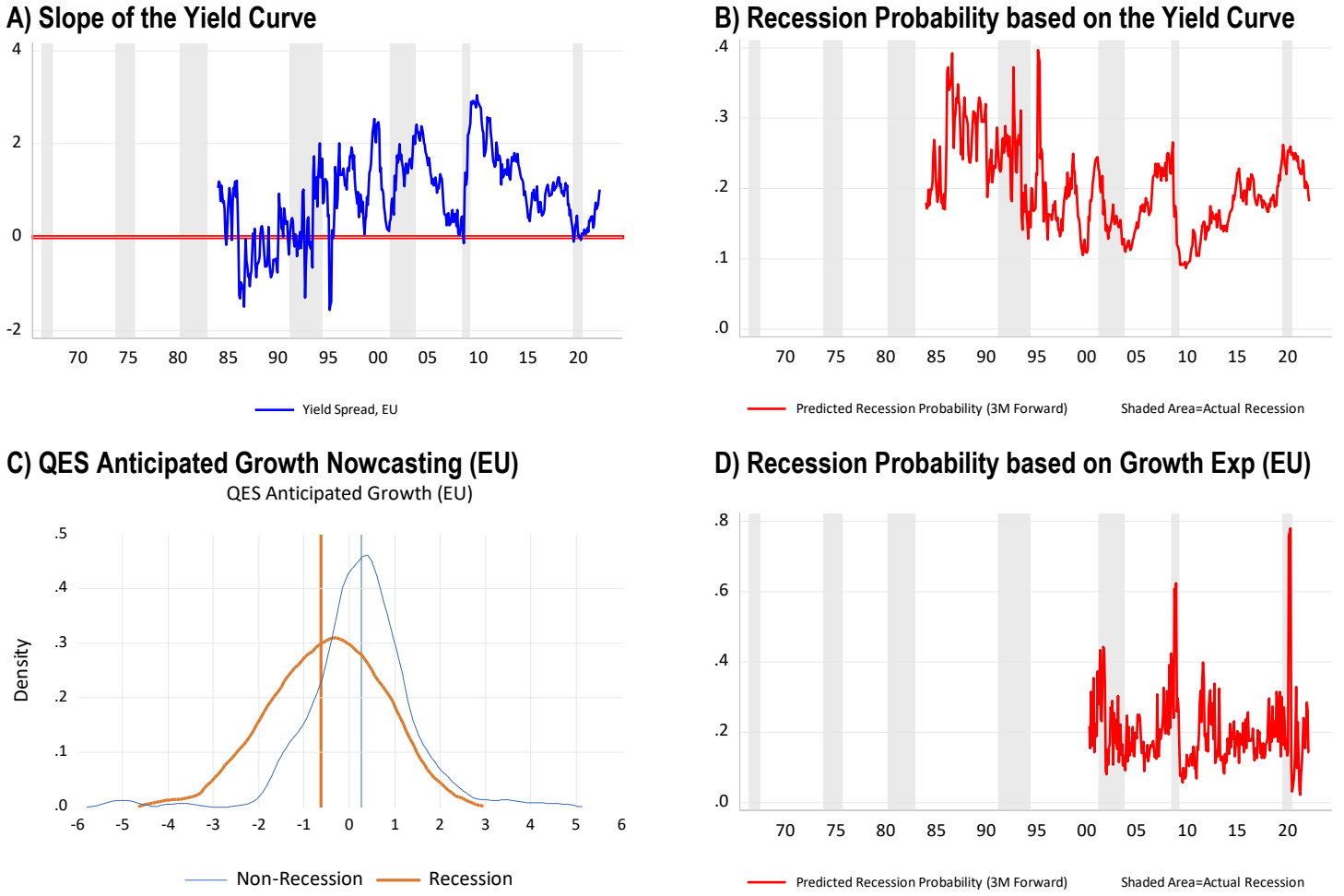


Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

The history of economic and macro data in Germany tends to be much shorter than the coverage in the US. As a result, the statistical confidence of many variables tends to be low for recession forecasting in Germany. we are able to identify more than 200 potential macro factors that are predictive of

recessions. For example, as shown in Figure 13(A), similar to what we observe in the US, the slope of the European government bond yield curve inverted or nearly inverted prior to each of the four recent recessions. Current yield spread is upward sloping, suggesting a small risk of recession in the near term (see Figure 13B). The economic fundamentals in Europe remain strong. Our QES anticipated growth nowcasting index was able to predict recessions at least three months ahead. Currently, our anticipated growth index suggests that recession risk in Germany is minimal (see Figure 13B).

Figure 13 Macro Factors and German Recession



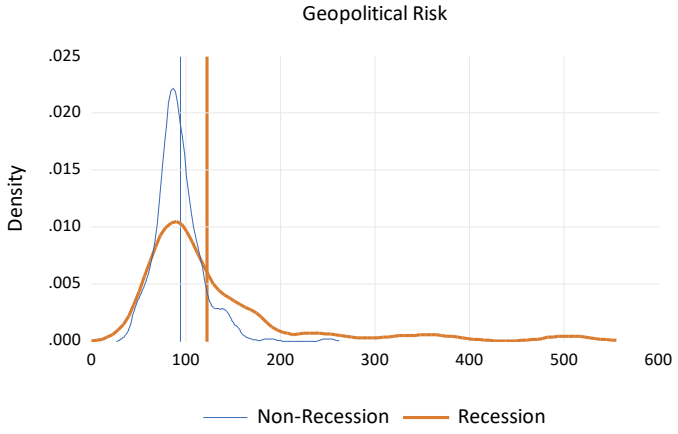
Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

Geopolitical Risk

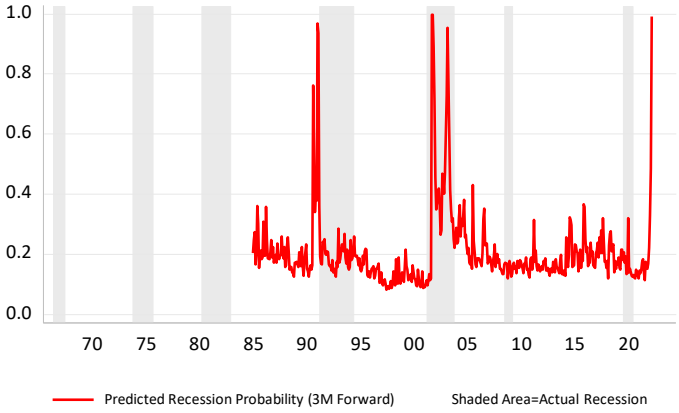
Unlike the US, the German economy is more vulnerable to geopolitical unrest and energy prices, because the country is much less self-sufficient on energy. Two of the past four recessions in Germany were associated with major geopolitical events (see Figure 14A and B). The Russia/Ukraine standoff has triggered a sharp increase in recession risk in Europe. Five of the last six recessions in Germany was preceded by oil crisis (see Figure 14C). As a result, the recent spikes in crude oil prices raise another warning sign for the German economy (see Figure 14D).

Figure 14 Geopolitical Risk, Energy Prices, and Recession, Germany

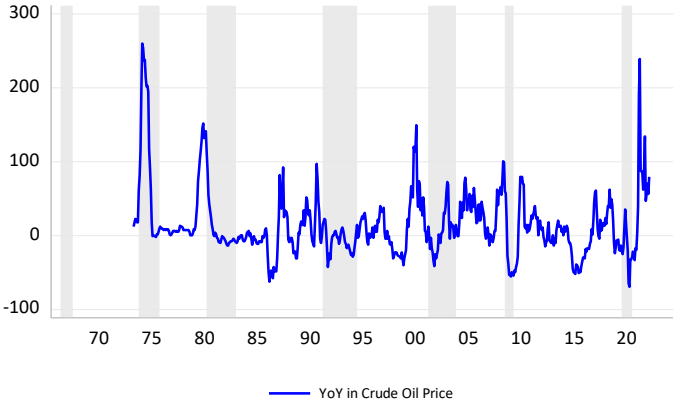
A) Global Geopolitical Risk



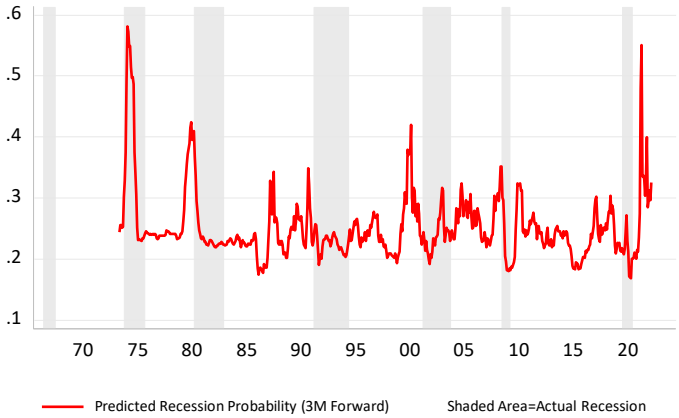
B) Recession Probability based on Geopolitical Risk



C) Crude Oil Price



D) Recession Probability based on Crude Oil Price



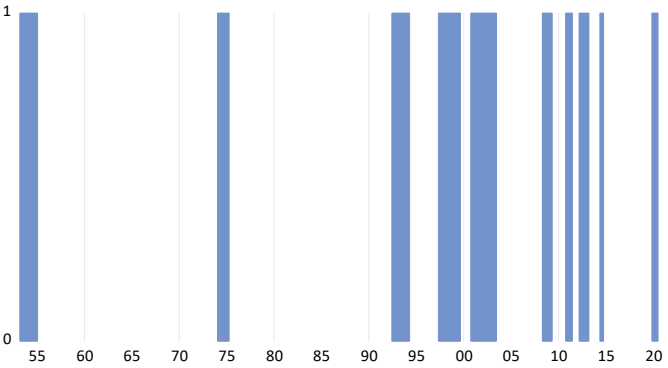
Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

JAPAN

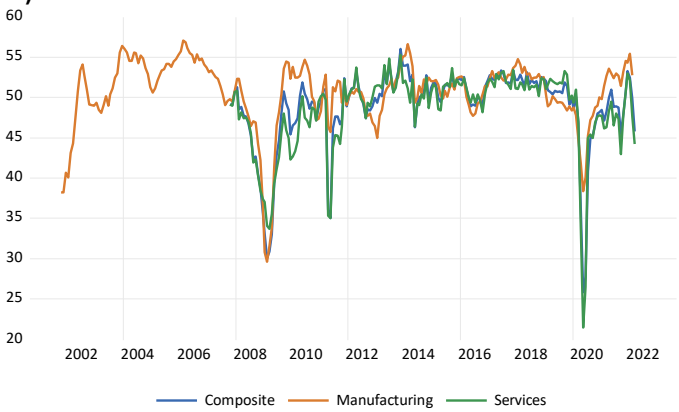
Based on ECRI, Japan has experienced 10 recessions since 1950s (see Figure 15A). Currently, Japan's PMI data is weak, at around 50-level, especially for the services sector (see Figure 15B).

Figure 15 The State of the Japanese Economy

A) Recession History



B) PMI



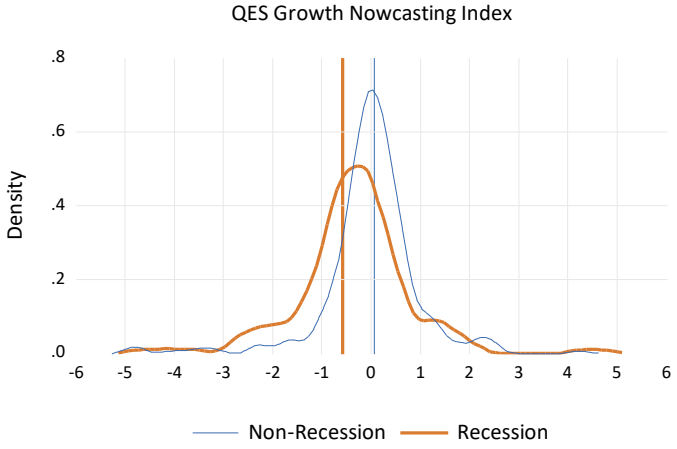
Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

Expected Economic Activities and Recession

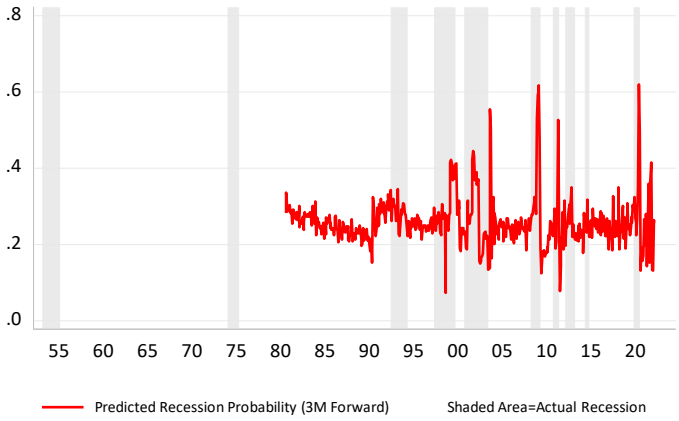
Our QES Growth Nowcasting Index typically dips before an official recession is identified in Japan (see Figure 16A). Current, our growth index is slight below long-term average, suggesting a modest recession risk in the near term (see Figure 16B).

Figure 16 Economic Activities and Recession, Japan

A) QES Growth Nowcasting



B) Recession Probability based on Growth



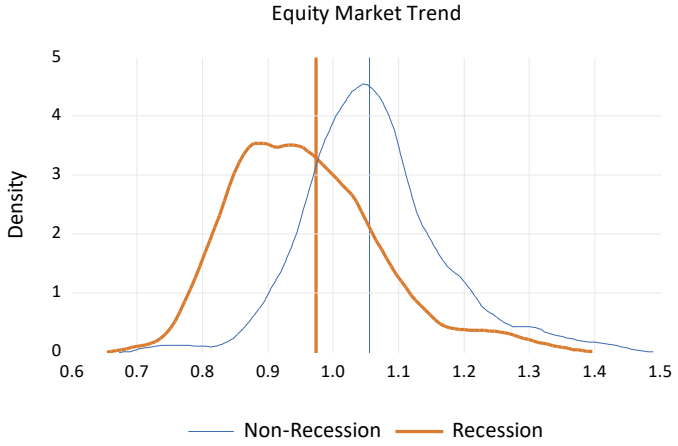
Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

Information from the Equity Market

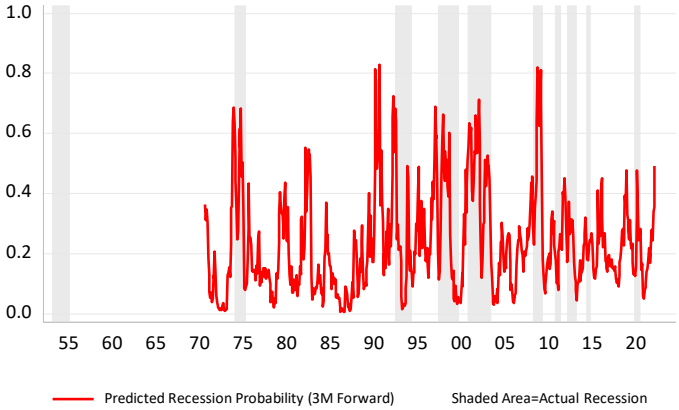
Similar to what we observe in the US, equity market trend is also predictive of near-term economic activities in Japan, albeit with many false alarms (see Figure 17A). The rough performance in Japanese equity market since Q4/2021 hints at a nonnegligible recession risk (see Figure 17B).

Figure 17 Equity Market Indicators and Recession, Japan

A) Equity Market Trend



B) Recession Probability based on Equity Market



Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

The Yield Curve – Evidence from Japan

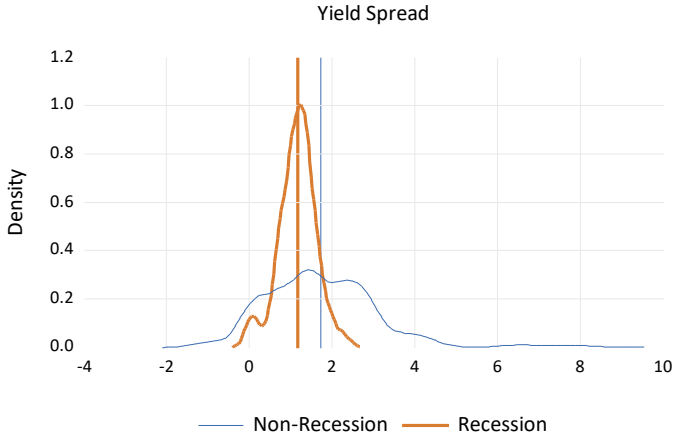
The predictive power of the yield curve on economic growth and recession is exceptionally strong in the US, as detailed in the previous section. Historically, the yield spread tends to fall prior to recessions in Japan (see Figure 18A). Currently, the slope of the yield curve in Japan is flat, suggesting a modest recession risk (see Figure 18B).

Lastly, the curvature of the yield curve is also predictive of future recessions in Japan, where a convex structure – a negative curvature parameter[2] – is associated with near-term recessions (see Figure 18C). Throughout the history, Japanese yield curve has been mostly convex. Currently, the curvature suggests a small recession risk (see Figure 18D).

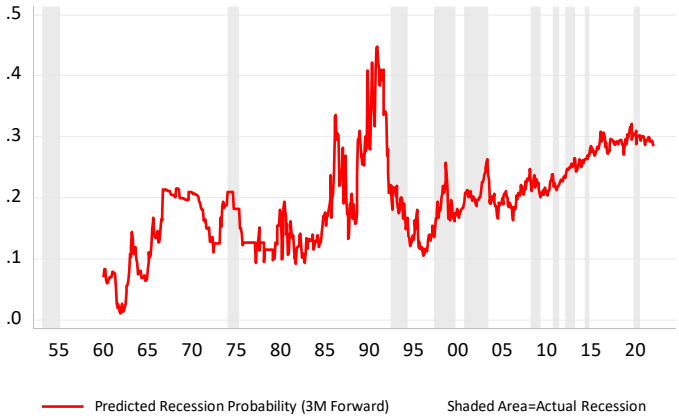
[2] This is based on the Diebold and Li [2006] model.

Figure 18 The Yield Curve and Japanese Recession

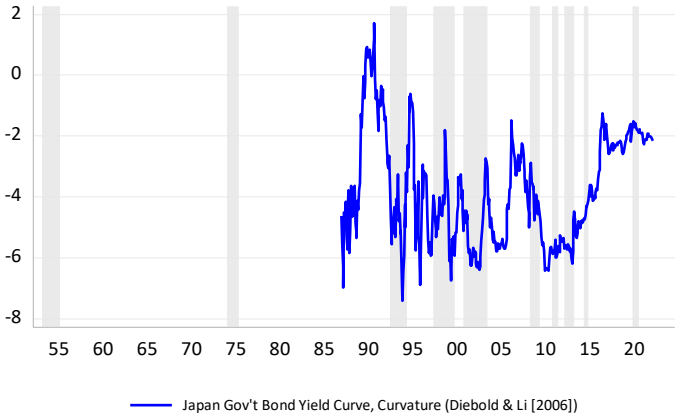
A) The Slope of the Yield Curve



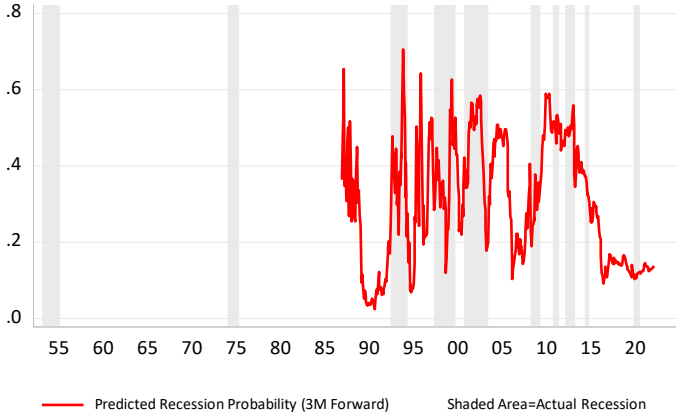
B) Recession Probability based on Yield Spread



C) The Curvature of the Yield Curve



D) Recession Probability based on Curvature



Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

GLOBAL RECESSION OUTLOOK

In this section, we summarize the recession risk for three major economies – the US, Germany, and Japan over the next three months. Results for other countries are available upon request.

US

In Figure 19, we select 14 representative macro variables that are predictive of US recessions with a three-month lead time. Currently, only the bond market tail risk factor points to a heightened recession risk in the US. All the other variables suggest that the recession probability in the near term is still low or modest. Economic fundamentals (e.g., slope of the yield curve, QES Growth Nowcasting) and expectations (e.g., QES Anticipated Growth Index) are robust. Equity market has recovered from the steep losses suffered at the beginning of the Russia/Ukraine war.

Overall, we expect the US economy to remain healthy in the midterm, barring from further escalation of geopolitical risk and inflation. The Fed must be extremely careful to strike a balance between containing inflation and not slowing down the economy too fast.

Figure 19 US Recession Prediction

Macro Variable	Current (Z-Score)	# of Years	Predictive Power	Relationship	Recession Probability	Recession Risk
Yield Curve and Policy						
Slope of the Yield Curve	0.23	102	Strong	Inversion → Recession	18%	Low
Economic Policy Uncertainty	0.64	37	Modest	High Uncertainty → Recession	9%	Low
Growth and Growth Expectation						
QES Growth Nowcasting	1.86	74	Strong	Low Growth → Recession	6%	Low
QES Anticipated Growth Nowcasting	(1.00)	44	Strong	Weak Expectation → Recession	15%	Low
Inflation and Commodities						
QES Inflation Nowcasting	1.75	63	Strong	Ultra High Inflation → Recession	27%	Modest
Crude Oil Price	1.41	49	Strong	Sharpe Rally → Recession	24%	Modest
Equity & Bond Markets						
Equity Market Trend	(1.15)	52	Strong	Bear Market → Recession	29%	Modest
VIX	1.39	36	Strong	High Vol → Recession	18%	Low
QES Bond Market Tail Risk	(2.32)	28	Strong	High Tail Risk → Recession	39%	High
Treasury Implied Vol	0.31	34	Strong	High Vol → Recession	7%	Low
Credit Spread	(0.45)	102	Strong	Large Spread → Recession	13%	Low
Global Economic and Geopolitical Risk						
Global Geopolitical Risk	7.07	37	Weak	High Risk → Recession	29%	Modest
EM Industrial Production	1.62	31	Weak	Weak Growth → Recession	5%	Low
Global Manufacturing PMI	0.38	24	Modest	Weak Growth → Recession	8%	Low
Summary					***18%***	***Low***

Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

GERMANY

The economic outlook in Germany is bleak. As shown in Figure 20, six out of the 11 indicators suggest that the near-term recession risk is high. Geopolitical risk, weak equity market, bond market tail risk, and surging oil prices pose the largest challenges for the European economy. On the positive side, economic fundamentals and anticipation remain robust. The ECB faces a much bigger challenge than the Fed and needs to walk on a tightrope to balance continued inflation (and rising commodity prices) and a double-dip recession.

Figure 20 German Recession Prediction

Macro Variable	Current (Z-Score)	# of Years	Predictive Power	Relationship	Recession Probability	Recession Risk
Yield Curve and Policy						
Slope of the Yield Curve (EU)	0.18	38	Strong	Inversion → Recession	18%	Low
Curvature of the Yield Curve (EU)	1.54	23	Strong	Concave → Recession	35%	High
Growth and Growth Expectation						
Manufacturing PMI (Germany)	(0.79)	26	Modest	Low Growth → Recession	20%	Modest
QES Anticipated Growth Nowcasting (EU)	0.47	22	Strong	Weak Expectation → Recession	14%	Low
Inflation and Commodities						
Expected Inflation (Germany)	0.01	68	Strong	Ultra High Inflation → Recession	23%	Modest
Crude Oil Price	1.41	49	Strong	Sharpe Rally → Recession	32%	High
Equity & Bond Markets						
Equity Market Trend (Germany)	(1.83)	52	Strong	Bear Market → Recession	53%	High
QES Bond Market Tail Risk (Global)	(2.32)	28	Strong	High Tail Risk → Recession	30%	High
Global Economic and Geopolitical Risk						
Global Geopolitical Risk	7.07	37	Strong	High Risk → Recession	99%	High
Baltic Dry Index	1.32	37	Weak	Low → Recession	17%	Low
Global Manufacturing PMI	0.38	24	Weak	Weak Growth → Recession	16%	Low
Summary					***33%***	***High***

Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

JAPAN

Most of the 10 indicators in Japan suggest that near-term recession risk is modest (see Figure 21). Equity market trend has been negative, and the heightened market volatility sends us some warnings. The slowing EM economy and global manufacturing activities pose further threats to the Japanese economy. Overall, the recession risk in Japan is modest.

Figure 21 Japan Recession Prediction

Macro Variable	Current (Z-Score)	# of Years	Predictive Power	Relationship	Recession Probability	Recession Risk
Yield Curve and Policy						
Slope of the Yield Curve (Japan)	(1.03)	62	Strong	Inversion → Recession	28%	Modest
Curvature of the Yield Curve (Japan)	0.92	35	Strong	Convex → Recession	14%	Low
Economic Policy Uncertainty (Japan)	(0.19)	35	Strong	High Uncertainty → Recession	26%	Modest
Blue Chip Short-Term Interest Rates Exp (Japan)	(0.84)	29	Modest	High Rate → Recession	29%	Modest
Growth and Growth Expectation						
QES Growth Nowcasting (Japan)	(0.05)	42	Strong	Low Growth → Recession	26%	Modest
Blue Chip FY1 GDP Growth Expectation	1.38	29	Strong	Weak Expectation → Recession	24%	Modest
Equity & Bond Markets						
Equity Market Trend (Japan)	(1.25)	52	Strong	Bear Market → Recession	49%	High
VIX (US)	1.39	36	Strong	High Vol → Recession	44%	High
Global Economic and Geopolitical Risk						
EM Industrial Production	1.62	31	Strong	Weak Growth → Recession	23%	Modest
Global Manufacturing PMI	0.38	24	Strong	Weak Growth → Recession	28%	Modest
Summary					***29%***	***Modest***

Sources: Bloomberg Finance LLP, FTSE Russell, Haver, S&P Capital IQ, Thomson Reuters, Wolfe Research Luo's QES

ASSET ALLOCATION STRATEGIES UNDER CURRENT ECONOMIC OUTLOOK

In summary, surging commodity prices and inflation remain the biggest threat to investors. Geopolitical risk poses the largest uncertainty to the global economy, commodities, and equity markets. Recession risk is low in the US, modest in Japan, but at an alarming level in Europe.

In the current economic environment, i.e., high inflation, strong economic growth, but nonnegligible risk of stagflation, we would like to introduce two new asset classes to traditional SAA (Strategic Asset Allocation) and TAA (Tactical Asset Allocation) framework – the RISE and the SHIELD.

Inflation Alpha Strategy – the RISE

As detailed in *Inflation Alpha*, the RISE (Rising Inflation Strategy for Equities) is a global stock-selection model, expected to generate exceptional alpha in an inflationary environment, while still deliver decent performance when inflation falls back. By construction, the RISE focuses on stock-specific idiosyncratic opportunities, by neutralizing major risk factors (country, sector, size, and beta) and style factors (e.g., cyclical value, price momentum, and volatility). Globally, the investable market neutral RISE strategy delivers a Sharpe ratio around 1.5x after transaction cost. The RISE model is particularly attractive in today's rising inflationary environment, providing strong upside participation and diversification benefit.

Active Defensive Strategy – the SHIELD

The SHIELD (Systematic Hedging for Investors to Evade Large Drawdowns) adds a very different dimension to our asset allocation decisions. As highlighted in *SHIELD 2.0*, the SHIELD is a machine learning powered global stock-selection model, specifically calibrated to hedge against equity market meltdowns yet remain resilient in up markets. Similar to the RISE, the market neutral investable SHIELD strategy is also orthogonalized against major risk factors (e.g., country, sector, size, beta, value and momentum). As a result, the SHIELD strategy is uncorrelated to most asset classes, with an after-cost Sharpe ratio around 1.5x.

Asset Allocation with Inflation and Recession Hedges

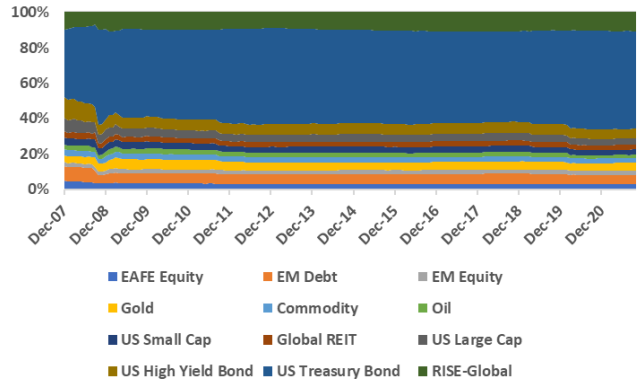
As a benchmark, we start from our standard 11 major asset classes, using a risk parity algorithm (as defined in Qian [2011] and Luo, et al [2017b]), with a monthly rebalance. The 11 asset classes are the same as in our TAA (Tactical Asset Allocation) portfolio (see a recent example in *Forward-Looking Interest Rates Exposure*).

Next, we add the RISE, and then both the RISE and SHIELD to the portfolio simulation. The risk parity portfolio allocates about a 10% weight to the RISE portfolio (see Figure 22A). Adding the RISE boosts performance consistently throughout the entire history (see Figure 22C), with a 37% gain in Sharpe ratio (see Figure 22D), a 23% increase in return (see Figure 22E), and a 20% reduction in downside risk (see Figure 22F).

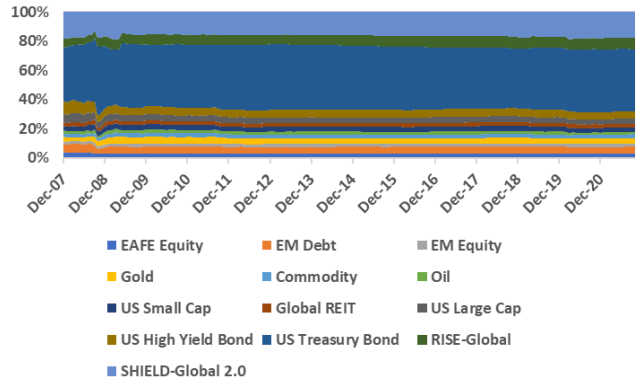
Furthermore, we can also add the SHIELD-Global 2.0 portfolio to the mix. As shown in Figure 22(B), with the addition of the SHIELD, the RISE receives a weight around 8%, while the SHIELD is allocated to 17% weight. Adding the SHIELD to the SAA portfolio more than doubles the Sharpe ratio of the benchmark SAA (see Figure 22D), while reduces maximum drawdown even further (see Figure 22F).

Figure 22 Adding the RISE (and the SHIELD) to a Strategic Asset Allocation Framework

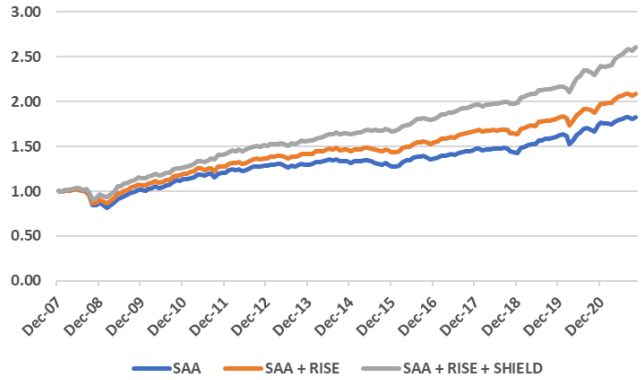
A) Asset Weight with the RISE



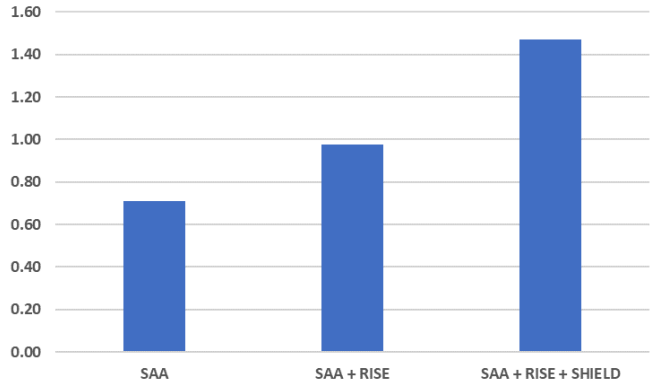
B) Asset Weight with the RISE and SHIELD



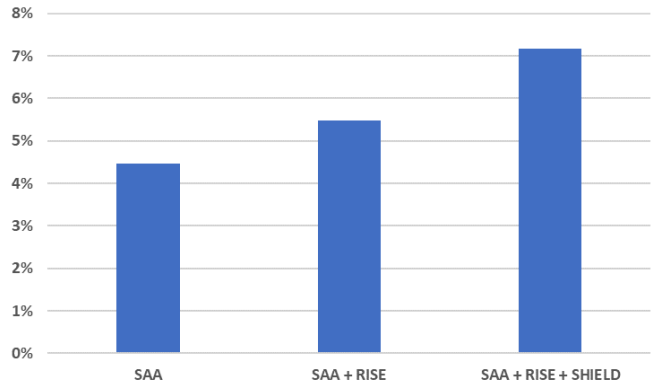
C) Cumulative Performance



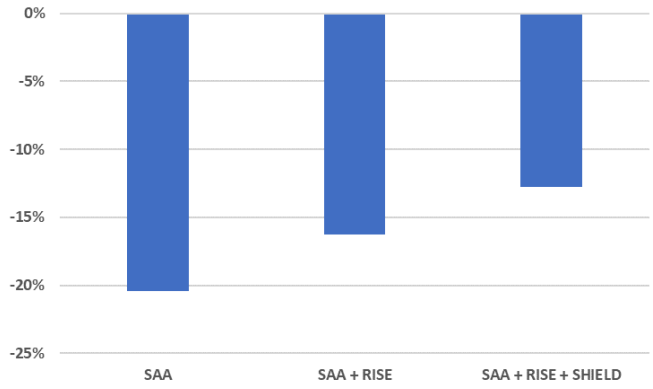
D) Sharpe Ratio



E) CAGR



F) Maximum Drawdown



Sources: Bloomberg Finance LLP, FTSE Russell, Markit, MSCI, RavenPack, S&P Capital IQ, Refinitiv, Wolfe Research Luo's QES

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DISCLOSURE SECTION

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