

RESEARCH PAPER

# Introduction to Unigestion's nowcaster indicators

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**FLORIAN IELPO**

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This note is a brief guide to the construction of the set of “nowcaster” indicators used at Unigestion. It reviews the value of using nowcasters for asset management purposes, the methodological choices that have been made to create Unigestion’s nowcasters and, finally, provides measures to quantify their accuracy.

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## 1. Why use nowcasting?

“Nowcasting” is a contraction of “now” and “forecasting” that is used to describe the practice of estimating current economic conditions. Nowcasting indicators have emerged over the past 10 years, essentially through the efforts of the research departments of various central banks. Many international organisations now provide a broad set of predictions, with a wide range of forecasting horizons. Forecasting is difficult, especially given the fact that even *current* economic conditions are challenging to assess. For example, the ultimate data series that makes it possible to measure economic growth – the quarterly change in Gross Domestic Product (GDP) – is published by statistical offices usually at least a month after the end of the quarter to which it refers. When attempting to assess how an economy is faring *today* it is therefore necessary to find a proxy for GDP growth: the most famous example is probably the ISM Manufacturing Index (ISM) that is widely used in the financial industry as an early measure of US GDP. However, another problem arises when relying on a single indicator: most of the potential candidate indicators are “noisy” and imperfect measures of the phenomenon they aim to appraise. The US manufacturing ISM indicator provides compelling evidence of both issues. As shown later in this note, depending on the threshold used to disentangle recessionary periods from expansionary, this popular indicator gives alarming signals far too frequently. Additionally, because it is focused on the industrial sector, it completely ignores what is happening in the services sector. At the very least, a mix of indicators is worth considering because their combination will both reduce the noise associated with individual indicators and lend a broader perspective to the final indicator.

The nowcasting indicators that have been developed over the past 15 years all deal with these issues: they blend together a broad spectrum of time series that are turned into a point-in-time signal. As discussed later, what is specific to nowcasting technology is that (1) it relies on a large data sample to mitigate noise within individual series and (2) it gathers this data in a way that turns it into a signal for a given period of time.

A connection between economic cycles and market cycles has long been established in academic literature. Indeed, it has been the founding philosophy for various investment processes. This connection holds for a wide spectrum of asset classes such as equities,<sup>1</sup> credit,<sup>2</sup> government bonds<sup>3</sup> and commodities.<sup>4</sup> Gauging where we stand in terms of the business cycle comes as a natural idea, explaining the vivid interest of market participants for nowcasting indicators such as the Atlanta Fed GDPNow<sup>5</sup> or the Nowcast GDP Growth indicator of the Federal Reserve of New York.<sup>6</sup> The nowcaster indicators that Unigestion has built focus on three dimensions: (1) growth, (2) inflation and (3) market stress. Each of these dimensions corresponds to one of the three key macro risks: (1) recession, (2) high inflation shocks and (3) surges in market stress. We believe these are the most significant macro factors that affect risk premia.

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<sup>1</sup> See, for example, Campbell and Diebold, 2009

<sup>2</sup> Gilchrist and Zakrajsek, 2011, and Gilchrist et al., 2009

<sup>3</sup> Ang and Piazzesi, 2003, Ang et al., 2006, and Diebold et al., 2005

<sup>4</sup> Bjornson and Carter, 1997 and Chevallier et al., 2014.

<sup>5</sup> See <https://www.frbatlanta.org/cqer/research/gdpnow.aspx>

<sup>6</sup> See <https://www.newyorkfed.org/research/policy/nowcast>



## 2. From business cycle indicators to nowcasting indicators

Assessing economic conditions seeks to answer the question: where are we in terms of the different phases of the business cycle, across output, prices and market stress conditions? This question has been heavily researched over the past 15 years by central banks' research departments. A larger set of methodologies are now available to answer the question, with clear differences amongst them. These economic condition indices can be split in two categories.<sup>7</sup>

The first type of indicator that has been proposed is based on a large number of data series that are combined into a single metric. Individual indicators have been found to be both volatile and only partial indicators of economic conditions; the cross-section of a large number of them makes up for both these flaws. Combined indicators probably started with Stock and Watson (2002): using a large data set, they constructed a smaller set of factors using a dimensional reduction technique called "Principal Component Analysis" (PCA). They show how using these factors makes it possible to forecast various economic time series in a better way than using individual data series. Their conclusions hold when forecasting both output- and inflation-related data.

Another example of such an index is proposed in Aruoba et al. (2012): here again, they extract a single factor out of a large sample of time series. Their refinement is that they rely on a model with unobservable factors, estimated using a Kalman filtering approach. By its very essence, the business cycle is an unobservable phenomenon: each data set carries its load of information "noise" regarding the evolution of the business cycle. The Kalman filtering approach makes it possible to assume a particular dynamic to it and therefore to make forecasts about it. The PCA does a similar job, but the structure of the business cycle factor only emerges from the dataset and is not controlled by the person building the index. The precision of the measure is a question tackled in Bernanke et al. (2005): what they call the "single step" approach provides its user with a precision that is as satisfactory as the more complex Kalman filtering approach. The Aruoba et al. (2012) index is available from the Fed of Philadelphia's website<sup>8</sup> with a long history. Other examples of such indicators can be found in Beber et al. (2015): here again, they gather economic time series by type – output- and inflation-related factors – before aggregating a large set of time series along these lines. The Chicago Fed National Activity Index (CFNAI) proposes a similar approach and is based on Stock and Watson (1989): it aggregates 85 macroeconomic time series into a single business cycle indicator.<sup>9</sup> What is common to all these contributions is that they let the factors be truly latent and unspecified: economic conditions remain what they are, a concept that is broad and sometimes quite vague.

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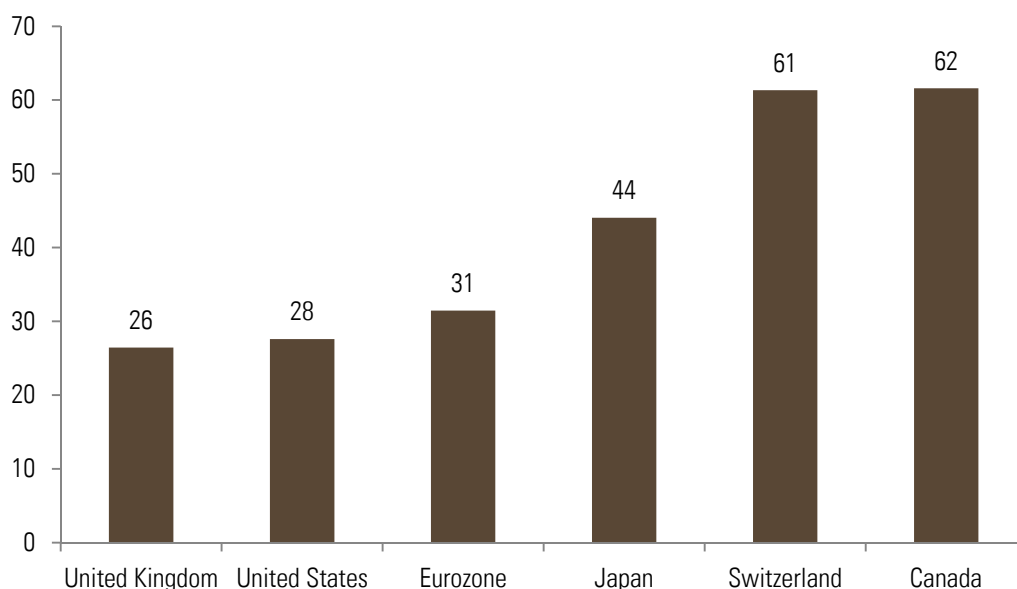
<sup>7</sup> Incidentally, there are other types of indicators that can be found in the academic literature such as Bakshi et al. (2011)'s Baltic dry index or Killian (2009)'s freight index. As in the case of the US ISM indicator, they remain partial indicators of the business cycle, offering no discrimination between geographical zones.

<sup>8</sup> See <https://www.philadelphiafed.org/research-and-data/real-time-center/business-conditions-index>

<sup>9</sup> The time series of the index is available here: <https://www.chicagofed.org/publications/cfnai/index>



**Fig. 1. Number of days after the end of the quarter before the publication of GDP data (January 2016)**



Source: Bloomberg. Unigestion's calculations.

The second stream of research papers that emerged more recently describes itself as “nowcasting”. Not only are business conditions unobservable but they also are difficult to assess in a timely way. For example, the most genuine indicator assessing current growth conditions is probably GDP growth, but depending on the country involved, the final estimation of this quarterly data series is usually available only 40 to 100 days after the end of the quarter for which it measures economic activity, as presented in Figure 1. In such a situation, “nowcasting” makes a lot of sense, and many central banks have invested heavily in such technology. The Federal Reserve of Atlanta proposes an online nowcasting indicator for the US economy that follows the methodology presented in Higgins (2014). Banbura et al. (2012) provides an overview of the existing literature on nowcasting indicators. One of the first attempts to create a methodology to “nowcast” GDP growth in the US using timely economic newsflow can be found in Evans (2005): the key difference between index technology and nowcasting is that in the case of the latter, economic news is turned into a GDP estimate. Nowcasting methodologies rely on hard data such as industrial production and soft data such as surveys to nowcast GDP growth. The bulk of existing contributions are based on the US economy. There are, however, articles that build nowcasting indicators for other economies.<sup>10</sup>

The main difference between the first and second type of indicator is essentially the “point-in-time” nature of the latter. The first type of indicator aims to create business condition indices, with no particular time frame: the cross-section of data delivers a “de-noised” signal that refers to an unknown time period. Nowcasters are indicators with a pre-set time frame. Their usefulness for investment purposes will therefore rely on the assumed connection between market and economic cycles. There is reasonable evidence that market and economic cycles are coincident, as highlighted in Boon and Ielpo (2016), making the case for using nowcaster indicators for asset allocation.

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<sup>10</sup> See, for example, Giannone et al. (2008), Kuzin et al. (2011) and Giannone et al. (2009) in the case of the eurozone, Mitchell (2009) for the UK, D’Agostino et al. (2012) in the case of Ireland and Rossiter (2010) and Ferrara and Marsilli (2014) for the world economy.



### 3. Unigestion's nowcasters

Most investment portfolios have a natural bias towards riskier assets such as stocks and credit bonds. There are three risks to this investment behaviour: recessions, periods of surprisingly high inflation and bouts of market stress. In order to nowcast each of these risks, Unigestion has developed three different types of indicator: a growth nowcaster in order to indicate recessions, an inflation nowcaster to indicate periods of surprisingly high inflation and a market stress nowcaster to indicate periods of market stress.

Each indicator is a combination of a limited number of components, each of which is a mixture of a shortlist of time series. Say  $x_t^{i,j}$  is the observation at time  $t$  of the  $i^{\text{th}}$  time series incorporated in the  $j^{\text{th}}$  component of a given nowcaster.  $C_t^j$ , the value of the  $j^{\text{th}}$  component at time  $t$ , is then computed as follows:

$$C_t^j = \frac{1}{l_j} \sum_{i=1}^{l_j} x_t^{i,j} \quad (1)$$

where  $l_j$  is the number of time series used to build the  $j^{\text{th}}$  component. The  $x_t^{i,j}$  are scaled time series: the original time series can have different scales, such as rates of variation or headline indicators. Scaling every data series makes them comparable so that they can be summed as in equation (1). Finally, the value for a given nowcaster  $N_t$  at time  $t$  is given by the following formula:

$$N_t = \frac{1}{I_N} \sum_{j=1}^{I_N} C_t^j \quad (2)$$

where  $I_N$  is the number of components associated with the nowcasting indicator. As highlighted in equation (2), each component receives the same weight in the final indicator. Two possibilities can be considered here: we decided to use an equal weight for each component to the indicator. Other weighting schemes could have been used. PCA could have been used to find the optimal weight per data series given the history of the dataset: it would however potentially prevent the model from capturing the signal of a recession that would not look like the recessions in the estimation sample. The equal-weight scheme that we use leaves each component free to contribute equally to the dynamics of the indicator.<sup>11</sup>

The underlying data series are not smoothed, as this would slow down their individual information content. The only source of smoothing comes from cross-sectionally averaging data series, which can be noisy, as shown in equations (1) and (2).

Now, beyond the methodology to aggregate the data, one of the essential ingredients for our nowcaster indicators is the list of selected data. The data-selection process has been done the following way:

- ✓ A list of potentially relevant macro data series that correspond to the phenomenon that needs to be nowcast has been created using various team members' experience as economists.

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<sup>11</sup> As explained in Zarnowitz (1991): "Empirically implemented stochastic models suggest that the US economy is exposed to a mixture of shocks, mostly small but occasionally large, with no one source being dominant. [...] (Models) have aggregate demand disturbances accounting for the largest proportion of the variance of total output; aggregate supply, fiscal, money, and credit shocks exert a smaller effect. As the forecast or simulation horizon grows longer, the relative importance of demand shocks tends to decline, that of supply shocks tends to rise."



- ∟ A sub-list of macro data with the relevant nowcasting ability, from  $R^2$  and correlation analysis, is then created.
- ∟ Then, component by component, data series have been z-scored using an expanding scheme and cross-sectionally averaged.
- ∟ Finally, nowcasters are obtained from the average of the cross-section of components as presented previously.

Finally, using this methodology, we have created three sets of nowcasting indicators: growth nowcasters, inflation nowcasters and market stress nowcasters. For the first two, the aim is to obtain a world nowcaster by combining country-level indicators. In the case of growth, our indicators currently cover 85% of the world's GDP.<sup>12</sup> Our growth nowcasters typically comprise the following components:

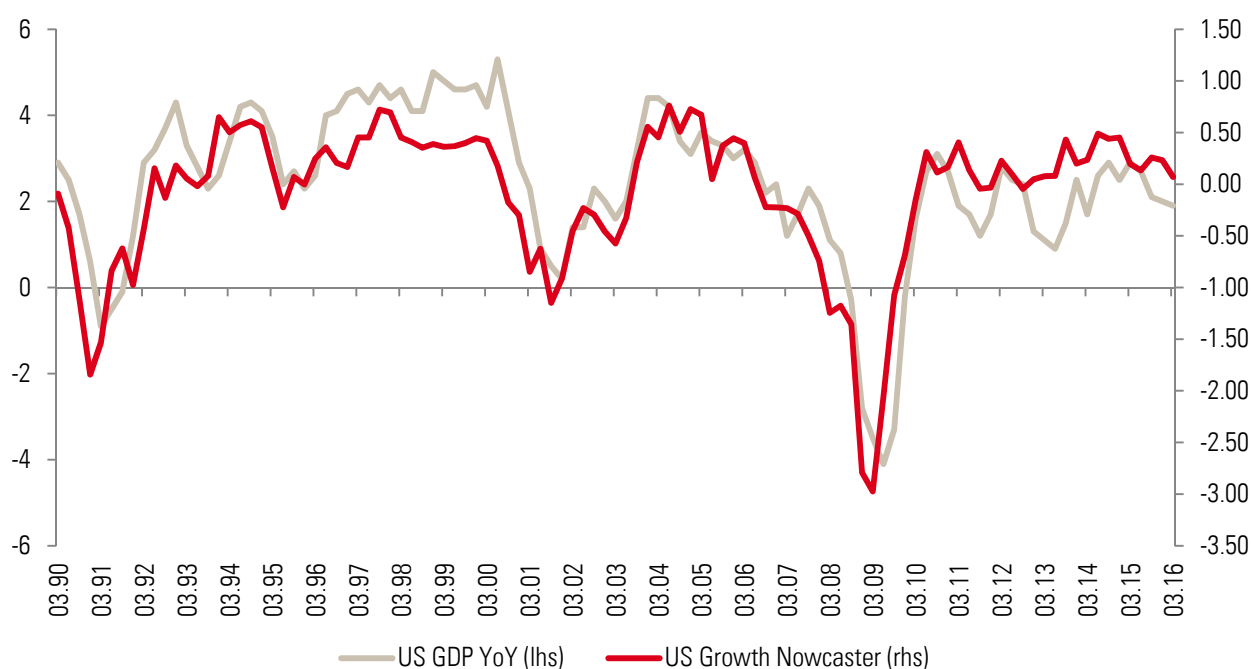
- ∟ The housing sector
- ∟ Durable goods consumption
- ∟ Production expectations
- ∟ Non-durable goods consumption
- ∟ Employment market
- ∟ Financing conditions for investments
- ∟ Investment perspectives

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<sup>12</sup> In the developed economy case, our indicators cover the US, Canada, the UK, the eurozone, Japan and Switzerland. In the emerging case, we have built an indicator for Brazil, Russia, India, China, South Africa and Mexico.



**Fig. 2. US growth nowcaster vs. US year-over-year change in GDP**



Source: Bloomberg, Unigestion's calculations.

These components have been inspired very much by the “real business cycle” line of academic literature.<sup>13</sup> Figure 2 shows the result of our US growth nowcaster indicators, along with quarterly changes in US GDP. The 1991, 2001 and 2008 recessions are clearly highlighted by the indicator. The signal reads the following way: when the aggregated indicator is higher (respectively lower) than zero, we say growth should be higher (lower) than the economy's potential growth rate,<sup>14</sup> hence isolating business cycle evolutions rather than structural changes. Figure 3 shows a typical decomposition of the growth nowcaster indicator in the US case per component. Again, a positive (negative) component means that the phenomenon it measures should be above (below) its historical trend. The figure compares the situation of July 2016 vs. that of December 2015: the deceleration in the housing, investment perspectives, financing conditions and durable good consumption components explains the lower readings reached by the US nowcaster signal. The figure also compares these two situations to two extremes: the highest point of the US cycle in February 2004 and the lowest point reached in February 2009.

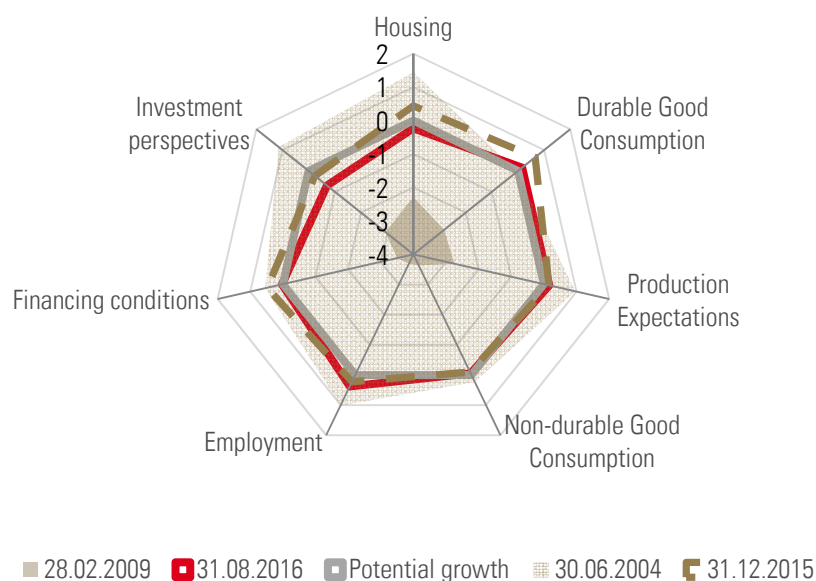
<sup>13</sup> See, for example, Long and Plosser, 1983, King and Rebelo, 1999 and Bernanke and Gertler, 1999.

<sup>14</sup> Estimates for long-term growth can be found on the International Monetary Fund or local central bank websites.





**Fig. 3. US growth nowcaster's radar decomposition per component**



Source: Bloomberg, Unigestion's calculations.

Our inflation nowcaster covers only developed economies at the moment and follows the same methodology as for its growth equivalent. The countries incorporated in the global signal are the US, Canada, the UK, the Eurozone, Japan and Switzerland, similar to the growth nowcaster case. Our indicator is the combination of the following five components:

- ↳ Imported inflation
- ↳ Input price inflation
- ↳ Wage inflation
- ↳ Supply-side inflation
- ↳ Expected inflation

Figure 4 shows the evolution of our US inflation nowcaster from 1990 to 2015 along with the year-over-year variation in the consumer price index.

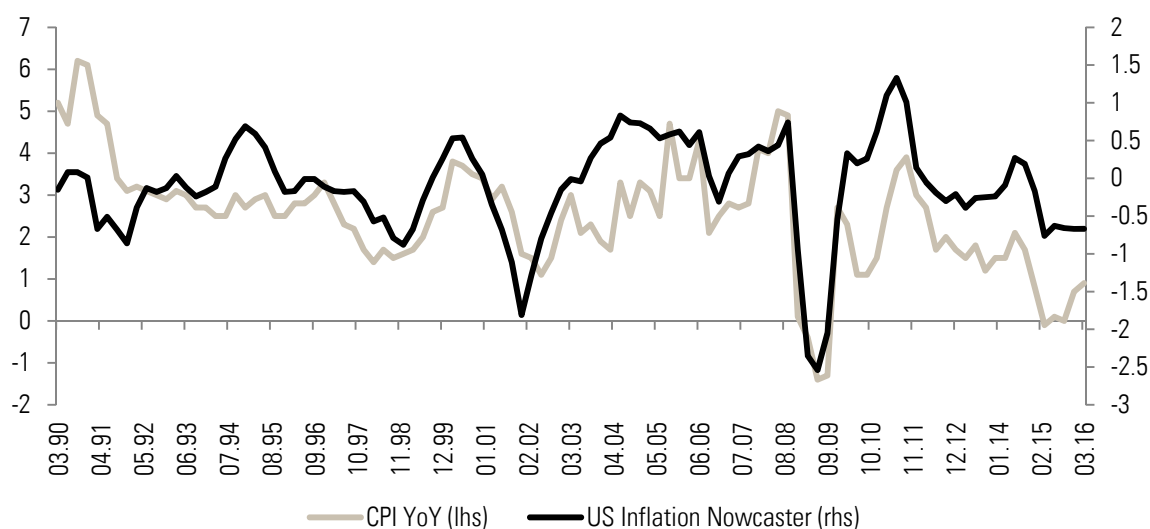
Finally, the market stress nowcaster has been built in a slightly different way. It incorporates three components:

- ↳ Liquidity
- ↳ Volatility
- ↳ Credit spreads



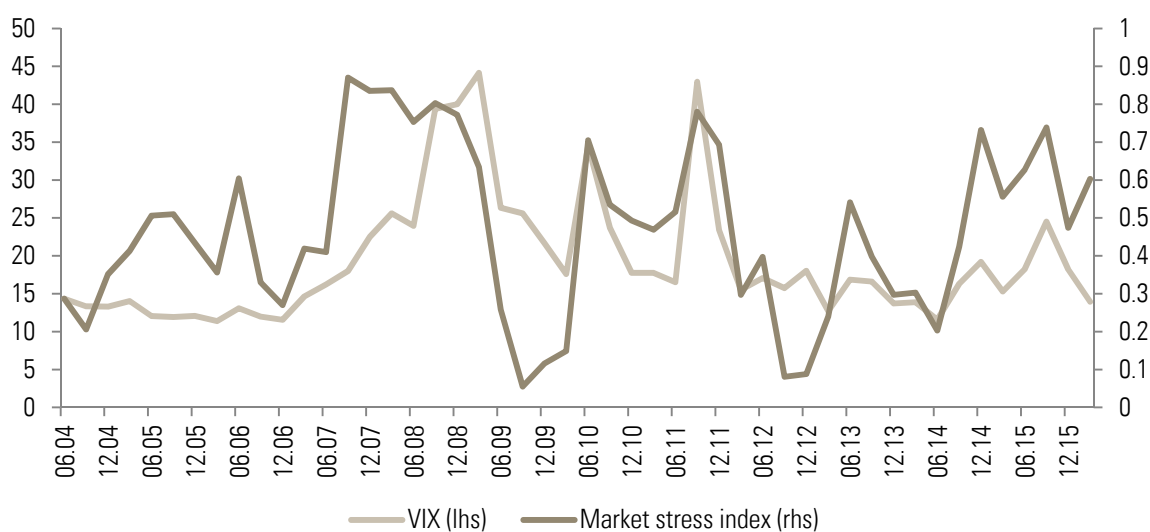
Instead of turning the underlying data into a z-score, the data is turned into a probability through a rolling quantile function over 250 trading days.<sup>15</sup> Figure 5 compares its evolution to that of the VIX – a partial indicator of surges in market stress across markets – over the 2004-2015 period. The figure shows again how the aggregation of a wider spectrum of data makes it possible to have a broader take on the underlying phenomenon. For example, the VIX started to rise in Q3 2007 when our nowcaster showed a much stronger signal a couple of months before. It showed similar behaviour ahead of the 2011 crisis: it does not mean that it should be considered a leading indicator, but it makes it clear how tensions across markets are not fully captured by the implied volatility indices that market participants usually follow.

**Fig. 4. Unigestion's Inflation nowcaster**



Source: Bloomberg. Unigestion's calculations.

**Fig. 5. Unigestion's Market Stress nowcaster**



Source: Bloomberg. Unigestion's calculations.

<sup>15</sup> Underlying data formed from market data only.

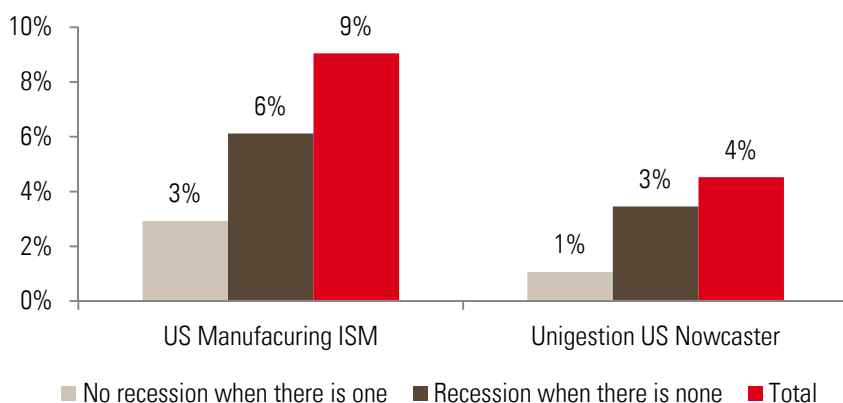


## 4. Analysing the accuracy of nowcaster indicators

In this final section, we discuss the quality of our approach to building nowcasting indicators, comparing our indicators to existing competing methodologies. The main comparison point that is available is for the growth nowcaster: the previously mentioned US manufacturing ISM is a natural candidate, as it is widely used among investment professionals as a gauge of the US economy's health. Another interesting potential competitor is the Federal Reserve of Atlanta's GDPNow indicator. It belongs to the nowcaster model type, therefore comparing well to our US growth nowcaster indicator.

Two comparisons are presented here. First, Figure 6 shows the frequency of false recession signals obtained with the US ISM and Unigestion's growth nowcaster, when compared to the official National Bureau of Economic Research's recession dates. The Atlanta Fed GDPNow indicator cannot be used here because its track record is shorter than that of the other two indicators. As indicated on the graph, the ISM has given around 9% of false signals over the 1985-2016 period compared to our nowcaster's 4%. Most of these false signals are actually periods during which there was no recession even though the ISM's level appears consistent with one. The nowcaster's false signals are evenly distributed between wrongly signalling recession and falsely indicating expansion: mixing a broader spectrum of components than what is available in an indicator like the ISM increases the precision of the signal obtained.

**Fig. 6. Percentages of false recession signals obtained from the US growth nowcaster vs. manufacturing ISM**

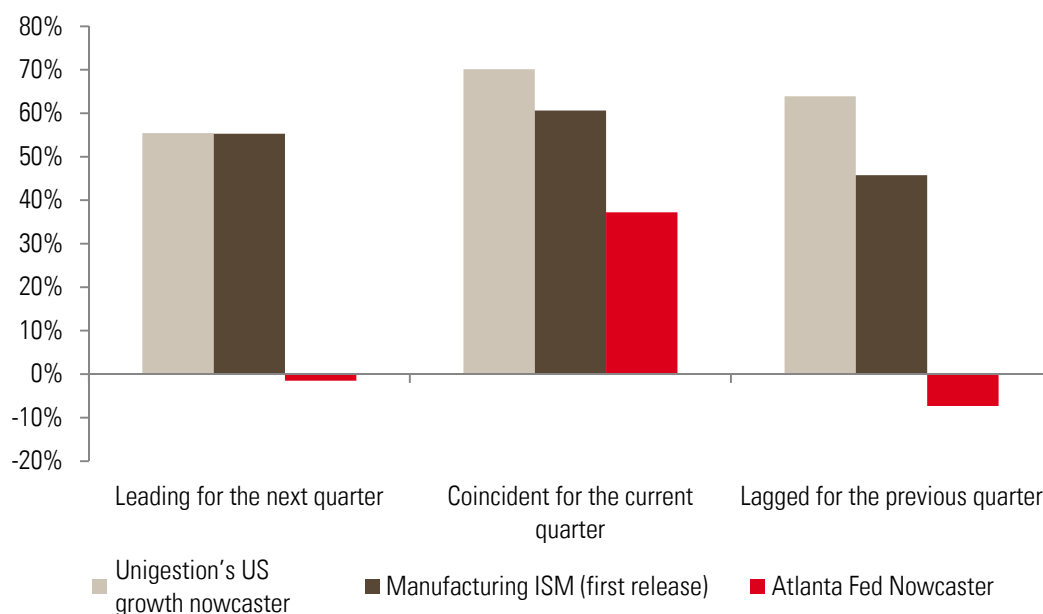


Source: Bloomberg, Unigestion's calculations, based on monthly data.

Figure 7 shows the correlation between US GDP growth and the two competitors. The correlations displayed show how each indicator correlates to US GDP growth in three cases: (1) when they are used as coincident indicators, (2) lagging indicators and (3) leading indicators. The Atlanta Fed nowcaster is a clear nowcaster of GDP growth, as it only has a positive correlation to GDP when investigating its coincident relationship to it. It has a negative correlation when it is considered as a leading or a lagging indicator. The ISM is positively correlated to GDP growth, and the correlation shows a peak as well when used as a coincident indicator. Interestingly, its correlation when used as a leading indicator is higher than when used as a lagging one. Our growth nowcaster shows the highest correlation of the three indicators. It peaks when used as a coincident indicator and shows a weaker correlation when used as a lagging or a leading indicator. All things considered, our growth nowcaster shows signs of containing an improved information set over the two other publicly available indicators.



**Fig. 7. Correlation between US GDP growth and selected business cycle measures, 1999-2015**

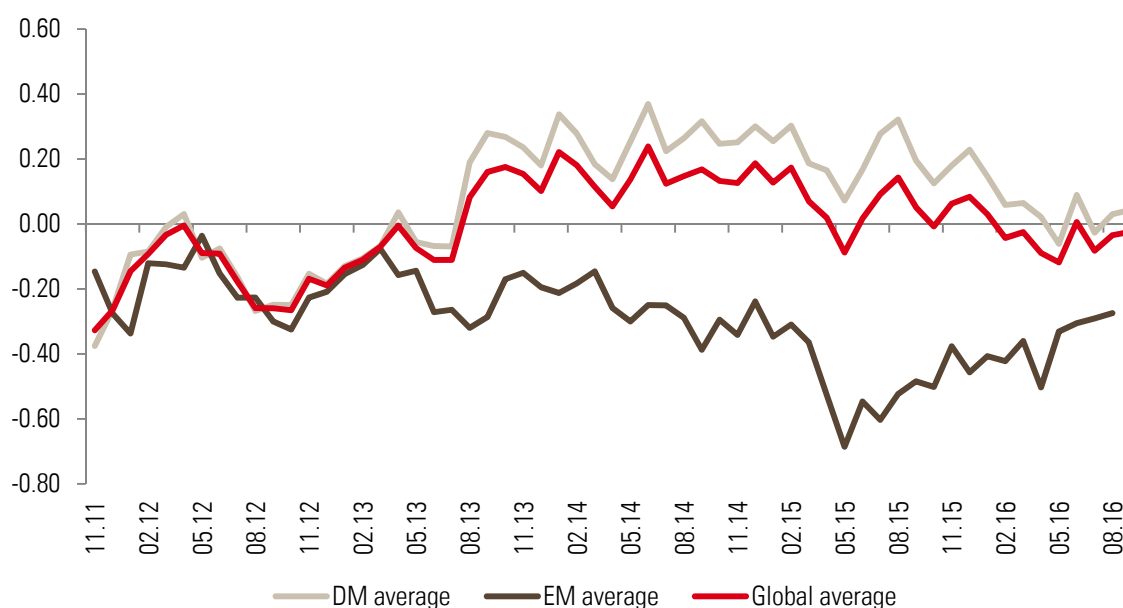


Source: Bloomberg, Unigestion's calculations.

Finally, one of the advantages of creating an in-house methodology is to be able to expand on what is currently readily available in the public domain for the US to the rest of the most significant economies.

Figure 8 shows the recent history of the aggregated signal when it comes to developed vs. emerging economies. The comparison between the two shows an interesting sign of a growing divergence that started in 2013 and probably ended in June 2015. The relative convergence that then took place probably explains part of the relative performance between emerging and developed stocks since late 2015.

**Fig. 8. Combined developed vs. emerging economies growth nowcasters**



Source: Bloomberg, Unigestion's calculations.



## 5. Conclusion

Unigestion has developed a set of nowcaster indicators in order to monitor three risks that investors face: recession, surprisingly high inflation and periods of market stress. Our indicators have been inspired by recent academic literature and have been created in the spirit of this research stream. Our current analysis shows that our approach to building them allows us to generate a richer signal – in terms of geographical zones that are covered – that translates into improved accuracy when compared with the most frequently used indicators that are publicly available to investors. A significant portion of our investment philosophy is based on these nowcasters, allowing us to dynamically tilt our allocation across asset classes in order to protect our investors from the three macroeconomic risks that are particularly detrimental to performance.



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