

South African manufacturing Purchasing Managers' Index™

A monthly index of business conditions in the manufacturing sector

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Introduction

The BER has proudly produced a monthly manufacturing Purchasing Managers' Index™ (PMI™)¹ since September 1999, with the first publication of the index in the public domain in September 2000. The PMI is currently sponsored by Absa Bank and released as the Absa PMI. The entire PMI time series as well as the monthly reports are available on the **BER's website**.

The manufacturing PMI is a composite index based on the results of five weighted questions. The results are derived from monthly surveys conducted under a representative group of purchasing managers in the manufacturing sector. In line with the experience internationally, the BER's PMI is closely watched as its consistent release on the first working day of the month means that it is one of the first indicators of how not only the manufacturing sector, but also the wider economy (and business cycle) fared during the month. Research in the US and elsewhere has shown that the manufacturing sector has specific qualities that make it especially relevant as a leading or cyclical indicator for the broader economy. This often holds true even as the share of manufacturing to the total Gross Domestic Product (GDP) declines over time. This is because the manufacturing sector is a supplier of goods to the primary industry (agriculture and mining), while also exposed to the tertiary industry (such as retail and wholesale). Therefore, it is often said that the factory sector is where recessions tend to begin and end. The PMI is also a useful tool to compare the performance of the manufacturing sector across countries, as the calculation and interpretation is broadly the same across the world.

This comment provides a background overview of the BER's manufacturing PMI. It also explains a change in the methodology, or more specifically the calculation, of the monthly PMI figure that came into effect from the October 2019 release. Finally, the note unpacks the PMI's relationship with official manufacturing production data and how this has changed since the domestic recession triggered by the global financial crisis (GFC) in 2008/09. The note also provides some possible reasons for this change.

¹ The PMI™ and PURCHASING MANAGERS' INDEX™ are trademarks of Stellenbosch University

Details of the South African manufacturing PMI

Survey respondents

The monthly survey is completed by purchasing managers² of factories across South Africa. Purchasing managers are in an exalted position to provide an early warning signal on, for example, changes in demand and supply conditions. Most respondents reply electronically³ and the BER regularly updates the distribution list to take account of businesses entering or exiting the market. The sample is fairly stable from month-to-month and the respondents receive the survey report as a token of appreciation for replying.

Importantly, individual **responses are not weighted for firm or sector size.**

Survey questionnaire

The BER's manufacturing PMI survey questionnaire consists of ten questions on the **monthly** changes in business conditions. Respondents are asked to indicate **qualitative changes** only, i.e. whether a particular phenomenon (for example activity or sales orders – see the box below) has increased, decreased or remained unchanged compared to the previous month.

The responses to the questions are converted to indices. **The indices are calculated by taking the percentage of respondents that reported an increase and adding it to one-half of the percentage that reported no change.** This results in an index for which a value of 50 indicates no change in the activity, a value above 50 indicates increased activity and a value below 50 indicates decreased activity. In line with the international norm, some of these indices are adjusted for seasonal variation in the data⁴. For the sake of transparency, the BER does not smooth the data further.

² The respondents in the BER's quarterly manufacturing business tendency survey are the most senior decision makers at factories, such as the plant manager, chief executive or chief financial officer. In contrast, purchasing managers are surveyed in the case of the PMI. Purchasing managers know about changes in supply and demand before other senior executives given their position in the supply chain (monitoring stocks of final goods and raw materials),

³ Because virtually all responses to the PMI now come through electronically (email) instead of traditional (slower) post services, the survey period was shifted to slightly later in the month in 2019. Furthermore, because the response data is automatically captured electronically, the processing of the results was also shifted out by one day as the process is much faster. This means that respondents reply later in the month than before and should have more information about developments during the month by the time they received the survey. This, in theory, allows for a more accurate reflection of actual developments.

⁴ Due to changes in seasonal patterns over time, the seasonal factors are recalculated once a year (usually around September/October), which then also necessitates the historical revision of the seasonally adjusted series.

Definitions to use with the PMI survey questionnaire⁵

1) **Business Activity – level (units/volume) of overall general business output**

The level/volume of general business output may be measured by production volumes, units of work accomplished, person-hours working, sales volumes or similar non-monetary measures. The reason for non-monetary indicators for this and several other questions is to prevent inflation from affecting the data over a period of time.

2) **New Sales Orders – level (units/volume) of overall new sales orders received**

The level/volume of new sales orders or other forms of requests for products, service or business activity received during the month whether or not fulfilled during the month. Again, we use non-monetary measures. It may be convenient to use the same unit of measurement for this question and for question 1.

3) **Backlog of Sales Orders – level (units/volume) of overall unfulfilled sales orders**

The level/volume of sales orders or other forms of requests for business activity output that have been received but not yet fulfilled (regardless of when they were received). This also needs to be a non-monetary measure and should be the same unit of measure used for question 2.

4) **Employment – level (units/number) of overall employment**

Level (units/number) of overall employment in your organisation including temporary and contract personnel.

5) **Purchasing Inventories - level(units/volume) of overall purchased stock**

The level/volume of overall purchased stock of materials and goods used in your normal business or activities. Indicate the direction of change, if any, in overall purchased inventory quantities (not finished goods unless purchased) and whether these quantities are above, equal to, or below the desired inventory levels.

6) **Purchasing Commitments - outstanding purchasing liabilities against lead time**

A usually irrevocable undertaking or responsibility in the obtaining of materials, goods and services in return for a consideration. Purchasing orders placed against lead time.

7) **Purchasing Supplier Deliveries - overall delivery performance of suppliers**

Overall delivery performance versus that of the previous month of suppliers of materials, goods and services purchased for the running of a business. If items and services are more readily obtainable this month than last month, then delivery performance is faster than a month ago. This item is not intended to measure actual versus expected delivery performance.

8) **Purchasing Prices - rate of change in overall purchasing prices**

Rate of change refers to the percentage change in the approximate overall weighted average prices paid for materials, goods and services purchased for conducting a business.

9) **Expected Business Conditions – compared to current levels, the expected change in the company/organisation's general business conditions in six months' time**

The expected general business conditions in six months' time compared to current conditions.

10) **Export Sales* – export sales(units/volume), only applicable if your company exports**

The level/volume of new export orders or other forms of requests for products, service or business activity received during the month whether or not fulfilled during the month. Again, use non-monetary measures. It may be convenient to use the same unit of measure for this question and for question 1.

** This question is surveyed, but the results are not published in the public domain. The resulting index does aid with the interpretation of movements in the headline PMI and overall new sales orders.*

Interpretation of diffusion indices

The indices are called diffusion indices and indicate the degree to which the measured change is dispersed or "diffused" throughout the sample population. When a diffusion index increases to a higher level within its increasing range (50 to 100 for the PMI indices), it suggests that a period of increased activity is becoming more dispersed through the factory sector. Furthermore, it implies that the activity is increasing

⁵ The questions ask to compare to current month's level of purchasing activity to the previous month's in terms of the indicators listed in the textbox.

at an accelerating rate. Diffusion indices tend to be **leading indicators** because typically the rate of change of an activity will change direction before the level of the activity changes direction.

Calculation of the PMI

The norm internationally is to aggregate five of these indices (business activity, new sales orders, supplier deliveries, inventories and employment) to form the headline index known as the PMI. The other indices provide additional information on, for example, price trends and expected conditions.

From the October 2019 PMI release, the headline South African manufacturing PMI⁶ is calculated as follows:

$$\begin{aligned} \text{PMI} = & \\ & \mathbf{0.05 \text{ Business activity} +} \\ & \mathbf{0.20 \text{ New sales orders} +} \\ & \mathbf{0.20 \text{ Employment} +} \\ & \mathbf{0.40 \text{ Supplier deliveries} +} \\ & \mathbf{0.15 \text{ Inventories}} \end{aligned}$$

This is a departure from the weights used since September 1999, but the same five indices are used as before. The historic PMI was recalculated with the new weighting method and revised accordingly⁷. Importantly, the change in index weightings only impacted the historic data for the headline PMI. The historic time series of the subindices are therefore still the same⁸.

The previous weights for the South African PMI were based on the weighting of the PMI produced by the Institute for Supply Management (ISM) in the US from 1982 to 2008. These weights based on analytical work by the US Department of Commerce were chosen to maximise the relationship between the PMI and GDP in the US⁹ in the early 1980s.

The BER decided to adjust the weighting assigned to the five included subindices in October 2019 after extensive research. The estimation of unique weighting for the South African PMI was possible because the series now covered twenty years, including both up- and downswing phases of the business cycle. A **regression analysis** was used to determine the weighting of the subcomponents of the PMI which would

⁶ For the sake of simplicity, the PMI data as released up to September 2019 will be referred to as the previous PMI, while the PMI calculated with the 'new' weights from October 2019 will simply be referred to as the PMI.

⁷ As before, the BER will continue to publish the full historic dataset for all the subindices, so should a user of the data prefer to calculate the PMI with the previous (or different) weighting method, this is possible.

⁸ Minor changes to the seasonally adjusted subindices from the September 2019 to October 2019 report are due to the recalculation of the seasonal factors which is done once a year.

⁹ In 1980, the US PMI was constructed as an equally weighted composite index of the five seasonally adjusted indicators. However, in 1982, the weights were adjusted to: 0.25 Business activity, 0.30 New sales orders, 0.20 Employment, 0.15 Supplier deliveries, 0.10 Inventories. These weightings were applied to the BER PMI for twenty years and still applies to most other international manufacturing PMIs. The ISM shifted back to equal weights (i.e. 0.2 per subindex) in 2008.

fit the reference series best¹⁰. The reference series is the year-on-year percentage change in the total manufacturing production index (seasonally adjusted) as published by Stats SA each month in the Manufacturing: production and sales (P3041.2) statistical release. The econometric estimation was based on data from September 1999 to July 2019. The weights were rounded slightly for ease of use, but this did not have a meaningful impact on the performance of the PMI compared to the exact, unrounded weights.

The selection of the five subindices that make up the headline PMI remained the same as before. Internationally, the manufacturing PMIs published by IHS Markit still use the previous ISM weighting method, which is different from the equal-weight method currently employed by the ISM. There is thus some precedent for the use of different weights across countries. It makes intuitive sense that, due to the decidedly different structure and nature of the South African economy and manufacturing sector compared to the US in the early 1980s (on which the previous weights were based), South Africa's weightings could be different from the US, or many other countries for that matter. Indeed, while it is (still) uncommon to apply unique country-specific weights to the subindices (components) making up the manufacturing PMIs, it is standard practice to use different weightings and variables (and to periodically revise these) to construct composite (summary) indices in non-PMI business tendency surveys. For instance, see the German ifo Business Climate Indicator, the Swiss KOF Barometer and the European Commission's Confidence Indicator.

The relationship between the PMI and manufacturing production

The main reason for the change in weightings of the PMI subindices was to address the deterioration in the correlation between the previous PMI and the reference series since the GFC. After the GFC, the co-movement between the changes in the PMI and actual production became poorer relative to the pre-crisis period. While it is not possible to fully determine why this happened, the behaviour of both the PMI and manufacturing production data changed in the aftermath of the GFC. Official manufacturing data as produced by Stats SA became unusually stable (barring exceptions due to production stoppages triggered by labour strikes or electricity disruptions), while the PMI was more volatile than before the GFC. Furthermore, while both series trended sideways during the pre-crisis period and downwards during the post-crisis period, the PMI's downward trend was more pronounced than that of Stats SA's manufacturing series. As a result, a gap opened up between the PMI and manufacturing in the post-crisis period, especially since 2017 – see Figure 1 and 2. The deterioration in the track record meant that the PMI lost some of its power as an early indicator of activity changes on a month-on-month basis. While the direction of the movement generally still reflected trends in the official data, it became more difficult to translate the magnitude of a movement in the PMI into a corresponding change in manufacturing production.

¹⁰ The BER also tested whether the track record between the PMI and reference series would improve if the weights of the five indices were equalised (to be in line with the current ISM method). While this leads to an improvement in the original weighting, the PMI resulting from the weights estimated by a regression performs significantly better, and the BER thus decided not to shift to equal weights.

Figure 1: Previous PMI and manufacturing production (monthly)

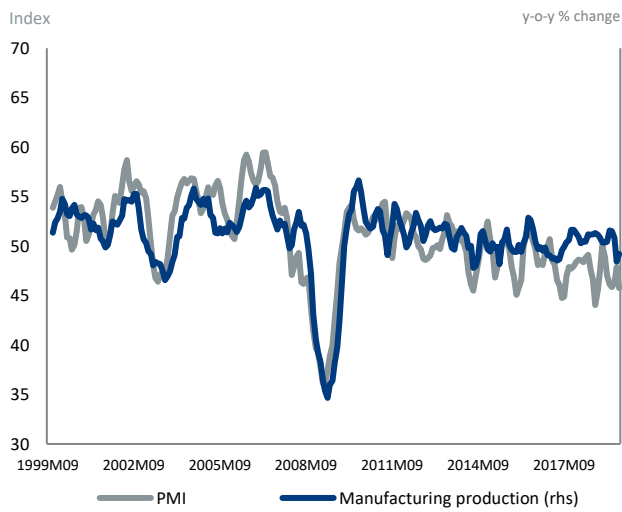
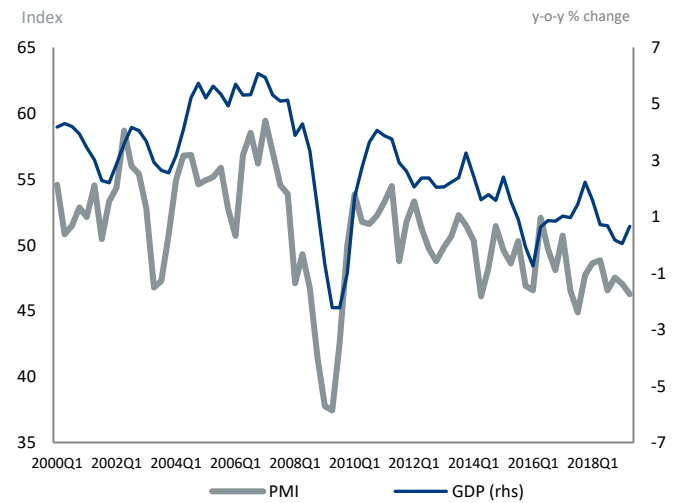


Figure 2: Previous PMI and real GDP growth (quarterly)



Source: BER, Stats SA (all data is seasonally adjusted).

A historic analysis shows that the recalculated weights reduce the volatility between successive months and as such corresponds better with the official production data. Figure 3 and 4 show the actual series, but due to volatility in both the PMI and official data, this is also smoothed by using a three-month moving average in Figure 5 and 6 for illustrative purposes.

Figure 3: PMI, previous PMI and manufacturing production (full period)

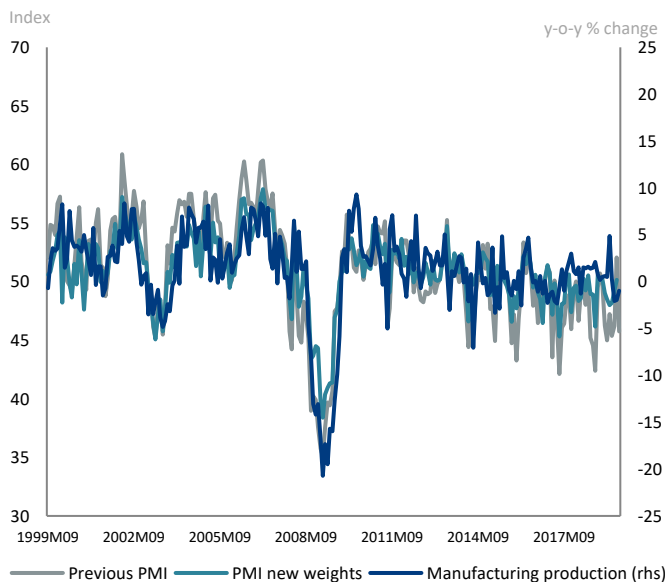


Figure 4: PMI, previous PMI and manufacturing production (post-crisis period)

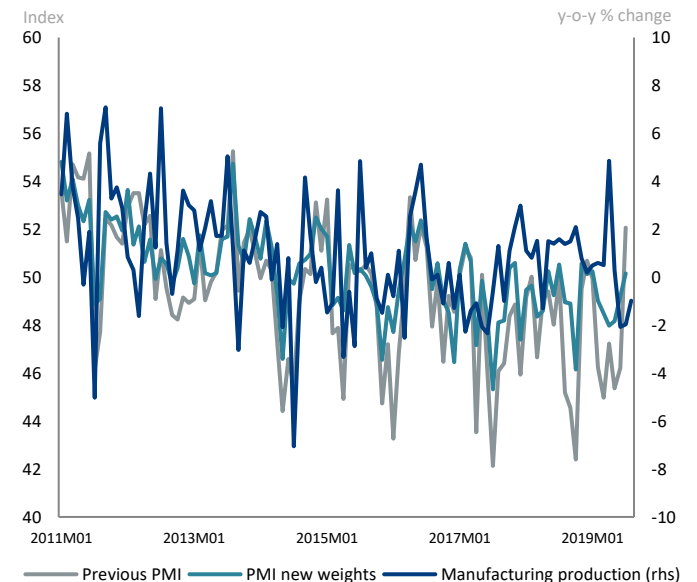


Figure 5: Smoothed PMI, previous PMI and manufacturing production (full period)

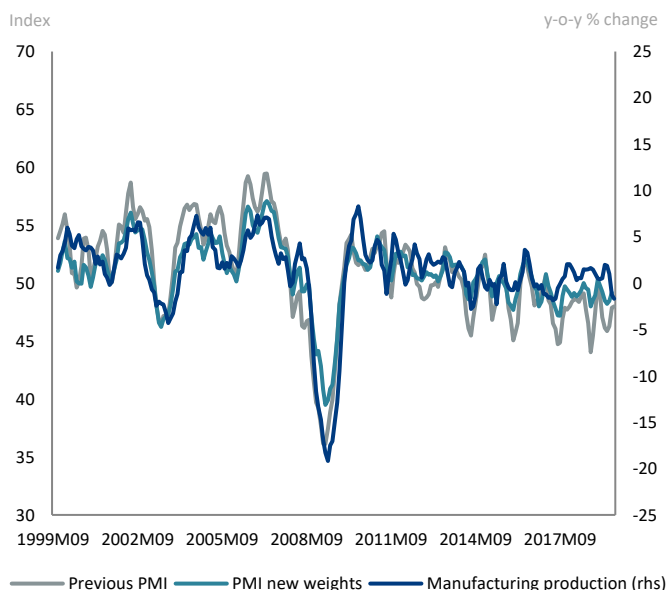
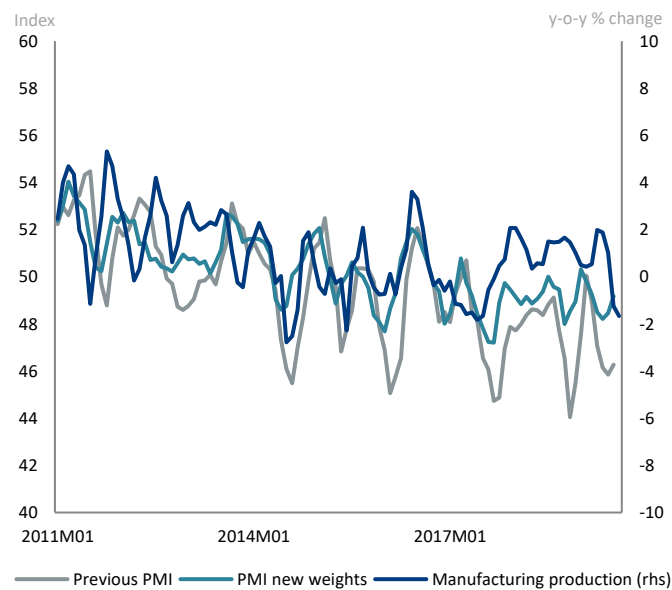


Figure 6: Smoothed PMI, previous PMI and manufacturing production (post-crisis period)



Source: BER, Stats SA (all data is seasonally adjusted).

Lower volatility, as reflected by the lower standard deviation shown in Table 1, is important as it helps with the interpretation of the results and reduces false signals. The main reason for the reduced volatility is because the supplier deliveries subcomponent, which is a more stable index has a higher weight than before. Combined, new sales orders and business activity (which are much more volatile) now contribute less to the headline PMI. The new PMI also has a higher correlation with the reference series, although it must be said that the post-crisis relationship with official data remains weaker than before the GFC. The correlation of the quarterly average of the PMI with the annual change in gross value added (GVA) by the manufacturing sector improves to 77% for the full period, from 72% before.

Table 1: PMI's volatility and correlation with the references series

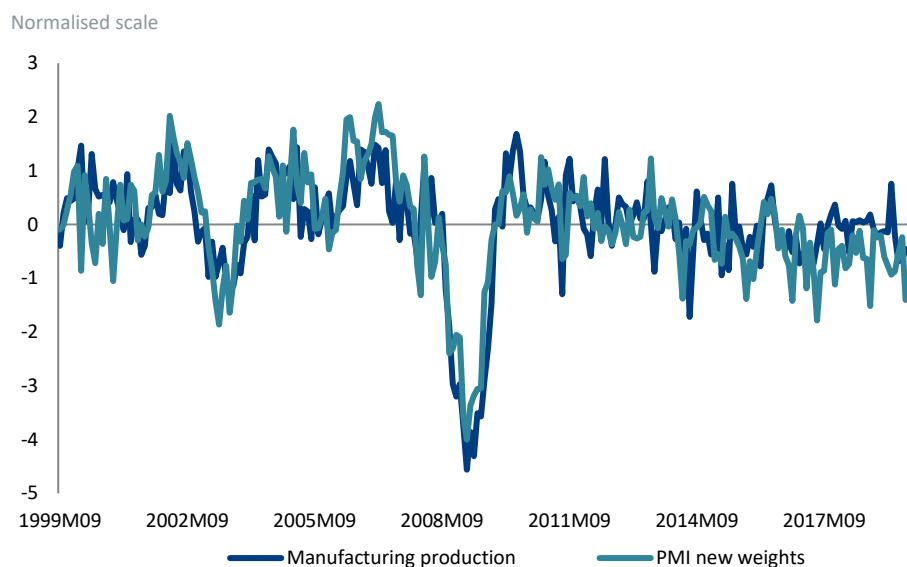
	PMI		Previous PMI	
	Full period (199909-201908)	Post-crisis (201101-201908)	Full period (199909-201908)	Post-crisis (201101-201908)
Standard deviation (measure of volatility)	3.1	1.9	4.6	3.0
Correlation (measure of co-movement)	75%	36%	70%	33%

Source: BER

The recalculated weights reduce volatility and result in a higher correlation with the reference series, but the figures above still show a gap between the PMI and official data - albeit smaller than before. Part of the remaining gap visible on the graph is because the unit of measurement between the PMI and

manufacturing production is different. Standard practice is to remove scale differences by standardising/normalising the series¹¹. As shown in Figure 7, this removes a large part of the gap.

Figure 7: Normalised scale PMI and manufacturing production



Source: BER

Reasons for a possible divergence between the PMI and official data

Although the PMI now has a much better fit to the official manufacturing data, especially since the GFC, Figure 4 shows it is still by no means a perfect relationship. The magnitude of the movement of the qualitative PMI and the corresponding quantitative reference series still does not match every month. In our view, the PMI should rather be used as a directional guide for the reference series. This is opposed to using the PMI in order to gauge the likely magnitude of any directional change in the reference series. This was also the case with the previous PMI.

There are a few reasons that could explain month-on-month differences between the reference series and the PMI. For example, the PMI does not account for size differences across firms or sectors and each response is assigned the same weight in the calculation. The official Stats SA data employs firm and sectoral weightings. Furthermore, as a diffusion index, the PMI typically shows developments that are widely dispersed (or prevalent) across sectors and firm sizes. This means that it does not fully reflect developments that are limited to a few large firms and only shows trends when these developments also spread to smaller firms and firms in other sectors. This means that the PMI may deviate from the official statistics in a particular month when a development was limited to a few big firms, such as petroleum refineries. This may have a significant impact on the official data as refineries make a big contribution to total output, but not the PMI as there are only a handful of refineries (and thus possible respondents in this sector) in the country. In contrast, there could also be a deviation between the PMI and official data when many firms report a small change. The magnitude of the change would then be overstated in the

¹¹ Normalisation converts both series to the same scale (unit) by subtracting the long-term average from each series and dividing it by its standard deviation.

PMI compared to the official data. In such instances, the PMI data also becomes more volatile even though the actual month-on-month changes in the official data are fairly small.

Another factor to keep in mind is that the post-GFC period, particularly since 2017, was characterised by significant **uncertainty**. International studies (and our experience) have shown that the relationship between survey data and actual data diminishes in times of increased uncertainty. The increase in external uncertainty may change respondents' behaviour. Relative to a more stable period in the past, in the current environment individual responses may reflect respondents' own uncertainty to a greater extent than actual changes in the variable in question.

Furthermore, while the headline PMI should in principle only capture actual changes in the activity component of the survey, we do suspect that the responses are at times affected by changes in **sentiment** rather than changes in actual activity. Manufacturing business confidence, as tracked by the Absa Manufacturing Survey¹², stood at a twenty-year low in 2019Q3 and has been extremely weak for a few years now. This is not only due to dwindling production levels, but also due to increased pressure on profitability and a more constrained business environment. In such a dismal operating environment, it is to be expected that respondents are at times inclined to assume that their production or demand levels are down compared to the previous month (as the trading environment is tough), while actual levels (as captured by the official data) are more or less the same, if not slightly better. Interestingly, this idea is supported by the Absa Manufacturing Survey results¹³, which also show a significant gap between the survey activity data (likely dampened by sentiment) and official production figures.

Lastly, it should be noted that the BER can only study the PMI survey composition and results, the official data from Stats SA is taken as a given. It could thus be that (at least a part of) the divergence stems from a change in the official data and not the PMI, with the PMI correctly reflecting the actual higher volatility.

Conclusion

The decision to adjust the PMI weights was not taken lightly and it is not our intention to make such changes frequently. Indeed, one of the main advantages of a PMI indicator is the fact that there are no revisions to the historical data apart from marginal changes during the re-estimation of seasonal factors. However, the main goal of the PMI is to provide a timely, reliable indication of how the economy has fared during a particular month. Over time, it has become more difficult to interpret the swings in the PMI. The updated weighting method should aid with interpretation and in translating movements in the PMI into expected movements in the reference series.

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¹² The latest Absa Manufacturing Survey report is available on our [website](#).

¹³ Responses to the Manufacturing Survey are adjusted for firm and sector weight, addressing some of the possible reasons why the PMI may divert from the official data.

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