**Index construction for the Small Business Pulse Survey**

**Phase 6**

Indexes are used to create a numeric representation of a question or set of questions that have non-numeric answers. Four indexes are constructed for the Small Business Pulse Survey (SBPS):

- The Overall Sentiment Index (OSI) assesses the overall effect of the pandemic on businesses.
- The Operational Challenges Index (OCI) assesses the overall effect of the pandemic on business operations.
- The Market Challenges Index (MCI) assesses the tightness in business conditions experienced by businesses. (Introduced in Phase 6)
- The Expected Recovery Index (ERI) summarizes the length of the expected recovery of businesses.

To calculate an index, each question response is first assigned a numeric value prior to the construction of the index. The Methodology section below describes the construction of the indexes.

The table below shows the questions included in each index as well as the numeric values used for each response in the calculation of the indexes.

*Overall Sentiment Index*

This index assesses the overall average effect of the pandemic on businesses. Negative values (up to -1) of the index indicate a negative effect (increasingly so as the index value approaches -1), zero indicates little or no effect, and positive values (up to +1) indicate a positive effect (increasingly so as the index value approaches +1).

*Operational Challenges Index*

This index assesses the average effect on general operations of businesses. Negative values (up to -1) of the index indicate a negative effect on operations (increasingly so as the index value approaches -1), zero indicates little or no effect, and positive values (up to +1) indicate a positive effect (increasingly so as the index value approaches +1).

*Market Challenges Index*

This index assesses the average tightness in business conditions experienced by businesses. Negative values (up to -1) of the index indicate less tight market conditions (increasingly so as the index value approaches -1), zero indicates little or no tightness, and positive values (up to +1) indicate tight market conditions) increasingly so as the index value approaches +1).

*Expected Recovery Index*

This index offers a measure of the average expected recovery time of businesses. Negative values (up to -1) of the index indicate that the business needs time to recover (and an increasing recovery period as the index value approaches -1), while zero indicates little or no effect (no recovery period).

| Index | Survey Question | Response Categories | Numerical Value Assigned |
|---|---|---|---|
| Overall Sentiment Index (OSI) | Q2 (Overall Impact) | Large negative effect | -1.0 |
| | | Moderate negative effect | -0.5 |
| | | Little or no effect | 0.0 |
| | | Moderate positive effect | +0.5 |
| | | Large positive effect | +1.0 |
| Operational Challenges Index (OCI) | Q4 (Revenue change) | Yes, increased | +1.0 |
| | | Yes, decreased | -1.0 |
| | | No | 0.0 |
| | Q5 (Temporary closure) | Temporary closure | -1.0 |
| | | Permanent closure | -1.0 |
| | | All other responses | 0.0 |
| | Q6 (Employment) | Yes, increased | +1.0 |
| | | Yes, decreased | -1.0 |
| | | No | 0.0 |
| | Q7 (Hours) | Yes, increased | +1.0 |
| | | Yes, decreased | -1.0 |
| | | No | 0.0 |
| | Q11 (Supply chain) | Any response besides none of the above | -1.0 |
| | | None of the above | 0.0 |
| Market Challenges Index (MCI) | Q10 (Difficulty hiring) | Yes | +1.0 |
| | | No | 0.0 |
| | | Not applicable | Not included |
| | Q11 (Supply chain) | Any response besides none of the above | +1.0 |
| | | None of the above | 0 |
| | Q14 (Change in demand) | Large increase in demand | +1.0 |
| | | Moderate increase in demand | +0.5 |
| | | Little or no change in demand | 0 |
| | | Moderate decrease in demand | -0.5 |
| | | Large decrease in demand | -1.0 |
| | Q15 (Change in prices) | Large increase in prices | +1.0 |
| | | Moderate increase in prices | +0.5 |
| | | Little or no change in prices | 0 |
| | | Moderate decrease in prices | -0.5 |
| | | Large decrease in prices | -1.0 |
| Expected Recovery Index (ERI) | Q20 (Expected recovery) | 1 month or less | -0.2 |
| | | 2-3 months | -0.4 |
| | | 4-6 months | -0.6 |
| | | More than 6 months | -0.8 |
| | | I do not believe this business will return to its usual level of operations | -1.0 |
| | | There has been little or no effect on this business's usual level of operations | 0.0 |

**Methodology**

Tabulating these responses encompasses calculating the response percentage of the question, as well as creating an index. An index is the weighted average of normalized responses for a question or across a set of questions, usually on a [-1,1] scale. The formulas for the proportion of responses is as follows:

$$PERCENT_a = \frac{\sum TAB\_WGT_i + \sum TAB\_WGT_{i'}}{\sum TAB\_WGT_I + \sum TAB\_WGT_{I'}}$$

Where:

| | |
|---|---|
| $PERCENT_a$ | Weighted response percentage for response category $a$ |
| $\sum TAB\_WGT_i$ | Total weight of firms who responded the same way from current panel |
| $\sum TAB\_WGT_{i'}$ | Total weight of firms who responded the same way late from the previous panel |
| $\sum TAB\_WGT_I$ | Total weight of all respondents from the current panel, regardless of response |
| $\sum TAB\_WGT_{I'}$ | Total weight of all late respondents from the previous panel, regardless of response |

The calculation of each index may be different for each of the four sets of questions that form the indices. In short, though, the formula is as follows:

$$EST_i = \frac{TAB\_WGT_j * index_{i,j}}{\sum TAB\_WGT_j}$$

Where:

| | |
|---|---|
| $EST_i$ | Weighted index $i$ value |
| $TAB\_WGT_j$ | Weight of record $j$ in index $i$ |
| $index_j$ | Average index value for record $j$ of index $i$ |

| $$\sum TAB\_WGT_j$$ | Total weight of all eligible firms |
|---|---|

There are four $EST_i$ values produced (for i = OSI, OCI, MCI, and ERI).

As an example, suppose there are three companies who responded to the questions in the Overall Sentiment Index (Question 2). Company A has TAB_WGT = 1, company B has TAB_WGT = 3, and company C has TAB_WGT = 4. Company A responded with "Large Negative Effect," so the index value equals -1. Company B responded with "No Effect" so the index value equals 0. Company C responded "Moderate Negative Effect" so the index value equals −0.5. Each of these three index values are multiplied by the TAB_WGT of the respective company (TAB_WGT of company A * index value of company A) and divided by the sum of the TAB_WGT of all three companies to calculate the estimate. In this example, the estimate equals

$$\frac{(-1*1)+(0*3)+(-0.5*4)}{(1+3+4)} = -0.375$$