Index construction for the Small Business Pulse Survey

An index may be used to create a numeric representation of a question or set of questions that have non-numeric answers. Four indices 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 Financial Stress Index (FSI) assesses the financial difficulties experienced by businesses.
- 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 indices.

Tables 1 and 2 show the questions included in each index for each phase of the SBPS as well as the numeric values used for each response in the calculation of the indices.

Overall Sentiment Index

This index assesses the overall 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 impact 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).

Financial Stress Index

This index assesses the financial stress experienced by businesses. Negative values (up to -1) of the index indicate a negative financial impact (increasingly so as the index value approaches -1), and zero indicates little or no financial impact.

Expected Recovery Index

This index summarizes the length of the expected recovery 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).

Table 1: Index coding for SBPS phase 1

Index	Survey Question	Response Categories	Numerical Value Assigned
Overall Sentiment Index (OSI)	Q1 (Overall Impact - Subjective)	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)	Q2 (revenue change)	Yes, increased	+1.0
		Yes, decreased	-1.0
		No	0.0
	Q4 (Closure)	Yes	-1
		No	0.0
	Q5 (Employment)	Yes, increased	+1.0
		Yes, decreased	-1.0
		No	0.0
	Q6 (Hours)	Yes, increased	+1.0
		Yes, decreased	-1.0
		No	0.0
	Q7 (Supply Chain Disrupt.)	Yes	-1.0
		No	0.0
Financial Stress Index (FSI)	Q10 (cash on hand)	1-7 days of business operations	-0.8
		1-2 weeks of business operations	-0.6
		3-4 weeks of business operations	-0.4
		1-2 months of business operations	-0.2
		3 or more months of business operations	0.0
		No cash available for business operations	-1.0
		Don't know	Not included
	Q11 (Loan miss)	Yes	-1.0
		No	0.0
	Q12 (Other payments miss)	Yes	-1.0
		No	0.0
	Q13 (Financial assistance)	This business has not requested financial assistance from any source since March 13, 2020	0.0
		All other responses	-1.0
Expected Recovery Index (ERI)	Q15 (Expected recovery duration - subjective)	Little or no impact	0
		1 month or less	-0.2
		2-3 months	-0.4
		4-6 months	-0.6
		More than 6 months	-0.8
		Never	-1

Table 2: Index coding for SBPS phase 2

Index	Survey Question	Response Categories	Numerical Value Assigned
Overall Sentiment Index (OSI)	Q1 (Overall Impact - Subjective)	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)	Q3 (revenue change)	Yes, increased	+1.0
		Yes, decreased	-1.0
		No	0.0
		Temporary closure	-1
	Q4 (Closure)	Permanent closure	-1
		All other responses	0.0
	Q5 (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
	Q9 (Supply Chain)	**Any response besides none**	-1.0
		None	0.0
Financial Stress Index (FSI)	Q12 (cash on hand)	1-7 days of business operations	-0.8
		1-2 weeks of business operations	-0.6
		3-4 weeks of business operations	-0.4
		1-2 months of business operations	-0.2
		3 or more months of business operations	0.0
		No cash available for business operations	-1.0
		Don't know	Not included
	Q13 (Loan miss)	Yes	-1.0
		No	0.0
	Q14 (Other payments miss)	Yes	-1.0
		No	0.0
	Q15 (Financial assistance)	This business has not requested financial assistance from any source since March 13, 2020	0.0
		All other responses	-1.0
Expected Recovery Index (ERI)	Q19 (Expected recovery duration - subjective)	Little or no impact	0
		Returned to normal	0
		1 month or less	-0.2
		2-3 months	-0.4
		4-6 months	-0.6
		More than 6 months	-0.8
		Never	-1
		Permanent close	-1

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 any 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 any 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_{index} values produced (OSI, OCI, FSI, and ERI).

As an example, suppose there are three companies who responded to the questions in the Financial Stress Index (i.e. questions 12, 13, 14, and 15). Company A has TAB_WGT = 1, company B has TAB_WGT = 3, and company C has TAB_WGT = 4. Company A responded "No cash available for business operations", "Yes" (Loan miss), "Yes" (Other payments miss), and "Paycheck Protection Program" to the Financial assistance question. The average index value equals $\frac{(-1)+(-1)+(-1)+(-1)}{4} = -1$. Company B responded with "3-4 weeks of business operations", "Yes", "No", and "SBA loan forgiveness", so the average index value equals $\frac{(-.4)+(-1)+0+(-1)}{4} = -0.6$. Company C responded "3 or more months of business operations", "No", "No", and "This business has not requested financial assistance from any source since March 13, 2020" to the questions in the index. So the average index value equals $\frac{0+0+0+0}{4} = 0$. Each of these three index values are multiplied by the TAB_WGT of the respective company (e.g., 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 $\frac{(-1*1)+(-0.6*3)+(0*4)}{(1+3+4)} = -0.35$.