

Online Appendix: Business Tendency Surveys and Macroeconomic Fluctuations

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B Additional results

B.1 Explanatory power various transformations

Table B.1 — Explanatory power various transformations

	CPI	GDP	Employment	Output gap
Balance	0.36	0.59	0.70	0.82
CP (I)	0.48	0.63	0.73	0.84
CP (II)	0.26	0.59	0.73	0.73
Unrestricted	0.35	0.58	0.69	0.88

Note: The table shows the R^2 of the factor model based on model specification (1) in Table 2. Each row uses a different transformation of the survey data. The balance statistic is the share of positive minus the share of negative answers CP (I) and (II) use the ? transformation including only the mean and the mean as well as the dispersion, respectively. The last row includes the share of positive and negative answers separately.

B.2 Explanatory power using BICM

Table B.2 — Explanatory power using BICM

	(A) Survey and hard data			
	CPI	GDP	Employment	Output gap
Entire data set	0.41	0.63	0.68	0.80
– surveys	0.28	0.66	0.60	0.58
– hard data	0.18	0.47	0.69	0.78
	(B) Sectors of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.41	0.63	0.68	0.80
– project engineering	0.36	0.61	0.72	0.80
– construction	0.36	0.58	0.62	0.81
– retail	0.36	0.61	0.66	0.77
– services	0.33	0.64	0.68	0.79
– hotels and restaurants	0.47	0.59	0.68	0.79
– wholesale	0.37	0.63	0.67	0.8
– manufacturing	0.35	0.57	0.67	0.73
	(C) Time reference of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.41	0.63	0.68	0.80
– current situation	0.31	0.64	0.62	0.72
– expected situation	0.40	0.59	0.74	0.81
– change last twelve months	0.38	0.59	0.64	0.79
– change last three months	0.36	0.64	0.67	0.79
– last quarter	0.39	0.63	0.67	0.81
– change to last years' quarter	0.37	0.59	0.69	0.78
– change to previous quarter	0.36	0.59	0.66	0.79
	(D) Frequency of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.41	0.63	0.68	0.80
– quarterly	0.37	0.69	0.66	0.74
	(E) Economic concept of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.41	0.63	0.68	0.80
– capacity constraints	0.35	0.67	0.66	0.82
– labour market	0.37	0.60	0.67	0.78
– prices	0.38	0.57	0.63	0.78
– real activity	0.30	0.65	0.72	0.78

Note: The first row of each panel shows the R^2 of the factor model based on model specification (1) in Table 2. Each subsequent row shows the R^2 after the removal of one dimension of the data set for estimating the factors.

B.3 Two factors

Table B.3 — Explanatory power $r = 2$

	(A) Survey and hard data			
	CPI	GDP	Employment	Output gap
Entire data set	0.38	0.63	0.68	0.81
– surveys	0.28	0.66	0.55	0.60
– hard data	0.14	0.53	0.66	0.75
	(B) Sectors of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.38	0.63	0.68	0.81
– project engineering	0.37	0.58	0.73	0.8
– construction	0.33	0.63	0.71	0.83
– retail	0.39	0.59	0.67	0.78
– services	0.39	0.64	0.69	0.81
– hotels and restaurants	0.39	0.64	0.68	0.79
– wholesale	0.39	0.63	0.69	0.80
– manufacturing	0.32	0.66	0.69	0.76
	(C) Time reference of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.38	0.63	0.68	0.81
– current situation	0.17	0.64	0.73	0.72
– expected situation	0.42	0.64	0.68	0.83
– change last twelve months	0.39	0.63	0.68	0.81
– change last three months	0.38	0.63	0.68	0.77
– last quarter	0.40	0.59	0.71	0.82
– change to last years' quarter	0.39	0.63	0.68	0.81
– change to previous quarter	0.39	0.63	0.68	0.81
	(D) Frequency of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.38	0.63	0.68	0.81
– quarterly	0.38	0.62	0.73	0.76
	(E) Economic concept of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.38	0.63	0.68	0.81
– capacity constraints	0.35	0.63	0.71	0.80
– labour market	0.39	0.64	0.69	0.80
– prices	0.38	0.64	0.68	0.78
– real activity	0.40	0.59	0.73	0.79

Note: The first row of each panel shows the R^2 of the factor model based on model specification (1) in Table 2. Each subsequent row shows the R^2 after the removal of one dimension of the data set for estimating the factors.

B.4 Four factors

Table B.4 — Explanatory power $r = 4$

	(A) Survey and hard data			
	CPI	GDP	Employment	Output gap
Entire data set	0.34	0.67	0.72	0.85
– surveys	0.29	0.67	0.70	0.61
– hard data	0.27	0.51	0.74	0.87
	(B) Sectors of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.34	0.67	0.72	0.85
– project engineering	0.39	0.63	0.73	0.80
– construction	0.44	0.61	0.72	0.82
– retail	0.38	0.66	0.66	0.84
– services	0.35	0.65	0.68	0.84
– hotels and restaurants	0.34	0.67	0.73	0.84
– wholesale	0.21	0.62	0.68	0.85
– manufacturing	0.39	0.64	0.69	0.75
	(C) Time reference of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.34	0.67	0.72	0.85
– current situation	0.31	0.64	0.70	0.75
– expected situation	0.35	0.69	0.78	0.85
– change last twelve months	0.33	0.64	0.69	0.85
– change last three months	0.35	0.67	0.72	0.80
– last quarter	0.44	0.63	0.74	0.84
– change to last years' quarter	0.43	0.64	0.68	0.85
– change to previous quarter	0.35	0.67	0.72	0.84
	(D) Frequency of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.34	0.67	0.72	0.85
– quarterly	0.35	0.68	0.76	0.82
	(E) Economic concept of surveys			
	CPI	GDP	Employment	Output gap
Entire data set	0.34	0.67	0.72	0.85
– capacity constraints	0.39	0.67	0.71	0.87
– labour market	0.37	0.68	0.78	0.85
– prices	0.35	0.66	0.72	0.83
– real activity	0.34	0.62	0.75	0.79

Note: The table shows relative root-mean-squared errors (RMSE) for the nowcast (horizon = 0) and forecast (horizons = 1–8). The factor model is based on specification (2) in Table 2 and the benchmark model on specification (3). We use a χ^2 test for the null of equal predictive ability against the one-sided alternative that the factor model has a lower RMSE. ***, **, * denote rejection of the null hypothesis at the 1%, 5%, and 10% level.

B.5 Share of selected benchmark indicators

Table B.5 — Share of selected benchmark indicators

	(A) $h = 0$			
	CPI	GDP	Employment	Output gap
Lags	0.00	0.00	0.00	1.00
PMI prices	0.72	0.18	0.06	0.00
PMI	0.02	1.00	0.48	0.98
KOF employment Index	0.34	0.00	1.00	0.62
Capacity utilisation	0.12	0.00	0.00	0.00
	(B) $h = 1$			
	CPI	GDP	Employment	Output gap
Lags	0.16	0.00	0.00	0.88
PMI prices	0.20	0.08	0.22	0.26
PMI	0.26	0.12	0.84	0.76
KOF Employment Index	0.78	0.92	1.00	1.00
Capacity utilisation	0.20	0.08	0.00	0.62
	(C) $h = 4$			
	CPI	GDP	Employment	Output gap
Lags	0.10	0.14	0.16	0.90
PMI prices	0.62	0.28	0.30	0.28
PMI	0.44	0.30	1.00	0.28
KOF Employment Index	0.10	0.80	0.16	0.96
Capacity utilisation	0.14	0.20	0.34	0.88
	(D) $h = 8$			
	CPI	GDP	Employment	Output gap
Lags	0.28	0.60	0.12	1.00
PMI prices	0.16	0.48	0.70	0.36
PMI	0.50	0.28	0.60	0.58
KOF Employment Index	0.58	0.78	0.78	0.90
Capacity utilisation	0.22	0.18	0.70	0.98

Note: The table shows the share of selected benchmark indicators and lags using model specification (3) in Table 2 at various forecast horizons.

B.6 Relative predictive ability time reference

Table B.6 — Relative predictive ability time reference

(A) Survey-factor model current situation				
Horizon	CPI	GDP	Employment	Output gap
0	–	1.22	1.12	1.07
1	0.97	1.16	1.21	0.95
4	0.83*	0.77*	0.61*	0.77*
8	0.86*	0.78**	0.50***	0.69
(B) Survey-factor model future expected situation				
Horizon	CPI	GDP	Employment	Output gap
0	–	0.99	1.13	0.99
1	0.97	1.07	1.23	0.78*
4	0.78*	0.78*	0.78	0.72*
8	0.80**	0.84	0.60**	0.76
(C) Survey-factor model past				
Horizon	CPI	GDP	Employment	Output gap
0	–	1.25	1.33	1.15
1	0.96	1.02	1.23	0.96
4	0.80**	0.78*	0.69*	0.74**
8	0.86	0.70*	0.55**	0.87

Note: The table shows relative root-mean-squared errors (RMSE) for the nowcast (horizon = 0) and forecast (horizons = 1–8). The factor model is based on specification (2) in Table 2 and the benchmark model on specification (3). We use a χ^2 test for the null of equal predictive ability against the one-sided alternative that the factor model has a lower RMSE. ***, **, * denote rejection of the null hypothesis at the 1%, 5%, and 10% level.

B.7 Relative predictive ability economic concepts

Table B.7 — Relative predictive ability economic concepts

(A) Survey-factor model capacity constraints				
Horizon	CPI	GDP	Employment	Output gap
0	–	1.36	1.05	1.24
1	0.97	1.10	1.18	1.08
4	0.81*	0.81*	0.64*	0.79*
8	0.86*	0.67**	0.55**	0.91
(B) Survey-factor model labour market				
Horizon	CPI	GDP	Employment	Output gap
0	–	1.28	1.24	1.23
1	0.96	1.08	1.35	1.03
4	0.84*	0.76	0.62*	0.96
8	0.92	0.81**	0.59**	0.63**
(C) Survey-factor model prices				
Horizon	CPI	GDP	Employment	Output gap
0	–	1.22	1.25	1.35
1	1.01	1.18	1.27	1.14
4	0.83*	0.75*	0.71	0.84
8	0.78**	0.70**	0.50***	0.65*
(D) Survey-factor model real activity				
Horizon	CPI	GDP	Employment	Output gap
0	–	1.04	1.07	0.98
1	0.95*	0.97	1.16	0.74**
4	0.77**	0.76	0.69	0.64**
8	0.85*	0.61**	0.56**	0.58*

Note: The table shows relative root-mean-squared errors (RMSE) for the nowcast (horizon = 0) and forecast (horizons = 1–8). The factor model is based on specification (2) in Table 2 and the benchmark model on specification (3). We use a χ^2 test for the null of equal predictive ability against the one-sided alternative that the factor model has a lower RMSE. ***, **, * denote rejection of the null hypothesis at the 1%, 5%, and 10% level.

B.8 Relative predictive ability robustness tests

Table B.8 — Relative predictive ability robustness tests

(A) Mixed-frequency survey-factor model ($r = 2$)				
Horizon	CPI	GDP	Employment	Output gap
0	–	1.06	0.96	1.03
1	0.94**	1.15	0.98	0.89
4	0.85	0.78*	0.51**	0.75**
8	0.88	0.86*	0.50***	0.65*
(B) Mixed-frequency survey-factor model ($r = 4$)				
Horizon	CPI	GDP	Employment	Output gap
0	–	1.09	1.09	1.19
1	0.88***	1.00	1.11	1.00
4	0.79*	0.94	0.62*	0.79*
8	0.85**	1.09	0.76**	0.80
(C) Mixed-frequency survey-factor model (BICM)				
Horizon	CPI	GDP	Employment	Output gap
0	–	1.04	1.13	1.23
1	0.93**	1.14	0.99	0.96
4	0.89*	0.87	0.56*	0.74**
8	0.85**	0.94	0.69*	0.72
(D) Hard and survey data (real-time vintages)				
Horizon	CPI	GDP	Employment	Output gap
0		0.82*	0.97	1.02
1		0.95	0.99	1.03
4		0.76*	0.69	0.75**
8		1.10	1.18	0.85*
(E) Survey data (real-time vintages)				
Horizon	CPI	GDP	Employment	Output gap
0		1.02	1.06	0.94
1		1.32	0.94	1.04
4		0.82	0.65*	0.73**
8		1.24	0.97	0.73***

Note: The table shows relative root-mean-squared errors (RMSE) for the nowcast (horizon = 0) and forecast (horizons = 1–8). The factor model is based on specification (2) in Table 2 and the benchmark model on specification (3). We use a χ^2 test for the null of equal predictive ability against the one-sided alternative that the factor model has a lower RMSE. ***, **, * denote rejection of the null hypothesis at the 1%, 5%, and 10% level.