



Assessing the COVID-19 impact and the speed of recovery with high frequency data

Macro Indicators on page 6

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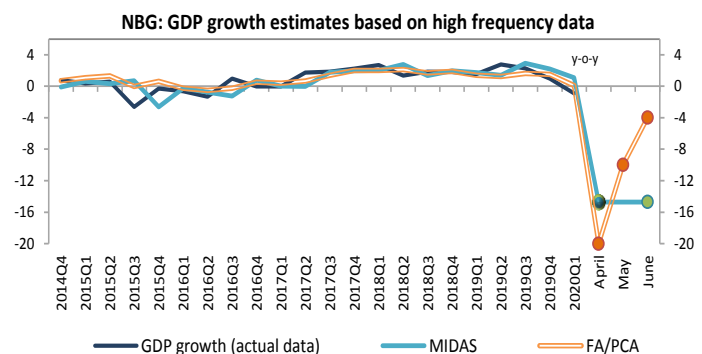
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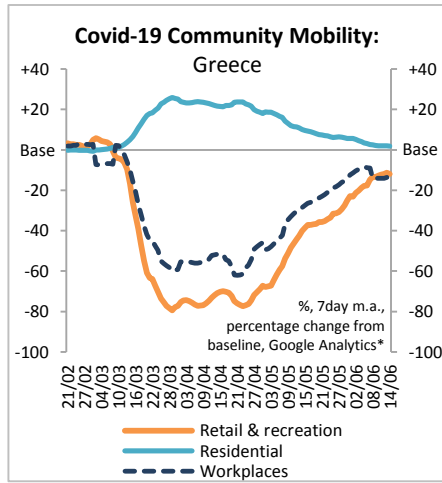
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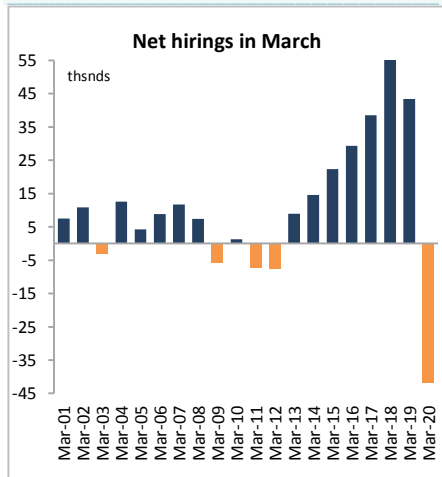
- A timely assessment of the Covid-19 impact on the Greek economy is highly important for decision-making and policy design. A significant range of indicators, which typically exhibit a high correlation with GDP and/or its components, is only available with a significant time lag, at a time when more timely indicators of the direction of activity are critical for the policy response.
- The Q1:2020 GDP data showed that only a small subset of high frequency indicators were able to timely capture the rapid deterioration in economic conditions in March. The challenge is to pick the set of these high frequency data that are accurate predictors of activity. However, the choice needs continuous updating, to capture the seasonal structure of the economy (e.g. the tourism season).
- Most high frequency indicators – including the recently-published data by ELSTAT on the turnover of enterprises – presage an unprecedented drop in activity in April and a subset of these indicators points to a pick-up in activity by mid-May.
- NBG Economic Analysis Division uses two empirical methods that are appropriate for effectively summarizing the information included in a broad set of economic indicators and predict GDP growth one quarter ahead.
- The results obtained by the first approach, which projects economic activity on a monthly basis, indicate a drop in monthly GDP of 21.0% y-o-y in April, which slows to -10.0% y-o-y in May and to -4.7% y-o-y in the first half of June, with still limited availability of indicators from the services sector for the latter month.
- The second approach, producing estimates of annual growth in quarterly GDP, presages a contraction of about 15.0% y-o-y in Q2:2020, with the projected rate of decrease slowing as new data releases are incorporated in the estimates for this period.
- NBG Economic Analysis forecasts of Greek GDP growth based on high frequency indicators are updated on a regular basis and will be available on the NBG website.



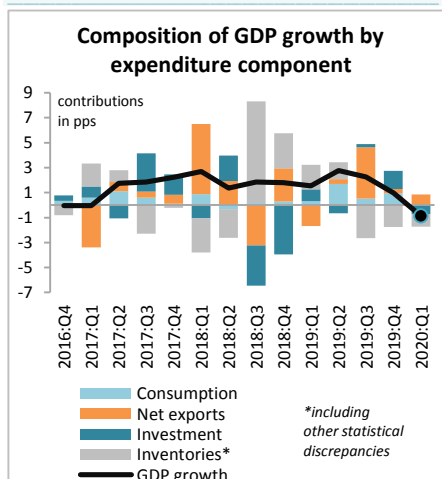
Only a small subset of high frequency indicators related to mobility and bank transactions...



...along with Ergani data on dependent employment flows...



...were able to timely capture the rapid deterioration in economic conditions in March that led to a decline in GDP of -0.9% y-o-y in Q1:2020



Assessing the Covid-19 Impact and the speed of recovery with high frequency data

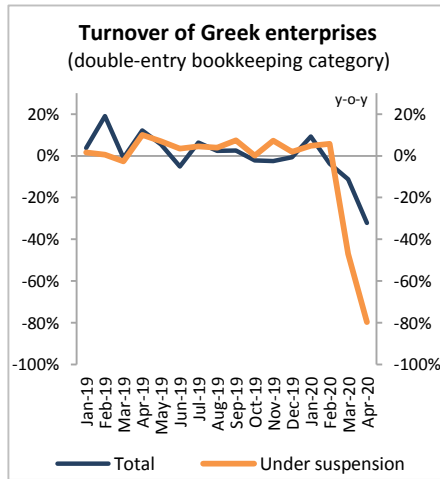
A timely assessment of the Covid-19 impact on the Greek economy is highly important for decision-making and policy design. A wide spectrum of heterogeneous information could be taken into account to track the rapidly evolving economic fallout of the pandemic, the impact of the containment measures and the subsequent response of the activity to the gradual easing of restrictions.

It should be noted that traditional indicators, which typically exhibit a high correlation with GDP and/or its components and are often used in the compilation of the national accounts data (e.g. retail sales, industrial production, indirect taxes, labor force survey data), are only available with a significant time lag. On the other hand, more timely available data in high frequency (monthly, weekly or daily) comprise a heterogeneous pool of variables, which are compiled with various methodologies, differ in terms of timing and frequency and refer to different parts of the economy, having – in some cases – only an indirect relation to the national accounts data. The challenge is to pick the set of these high frequency data that are accurate predictors of activity.

Our empirical analysis indicates that only a small subset of high frequency indicators (“HF indicators”) related to mobility and bank transactions, along with Ergani data on dependent employment flows, were able to timely capture the rapid deterioration in economic conditions in the second half of March that led to a decline in GDP of -0.9% y-o-y in Q1:2020 (despite the strong momentum of economic activity in 2M:2020).

The first set of survey data and conjunctural indicators available for April and May 2020 point to a further broad-based drop in activity, following the complete enforcement of containment measures, with the majority of indicators declining to multi-year lows – from very high levels reached in 2M:2020. These trends are confirmed by recently published data by ELSTAT on the turnover of the Greek business sector, which recorded an unprecedented 32% y-o-y drop in April, with accommodation, transportation and wholesale & retail trade suffering turnover losses of 91.9% y-o-y, 65.6% y-o-y and 28.6% y-o-y, respectively. Similarly, subsectors of manufacturing producing discretionary goods and consumer durables, along with the oil refining sector, experienced declines in turnover in excess of 60% y-o-y.

Turnover of the Greek business sector recorded an unprecedented 32% y-o-y decline in April



A mild drop in employment in March (-0.3% y-o-y) was accompanied by a fall in the unemployment rate to a 9-year low, due to an increase in non-active population by 5.4% y-o-y



Most recently, a subset of HF indicators (especially indicators related to mobility and bank transactions) pointed to a bottoming-out in activity since mid-May that is gaining additional traction in June 2020 according to weekly data from mobility and financial transactions.

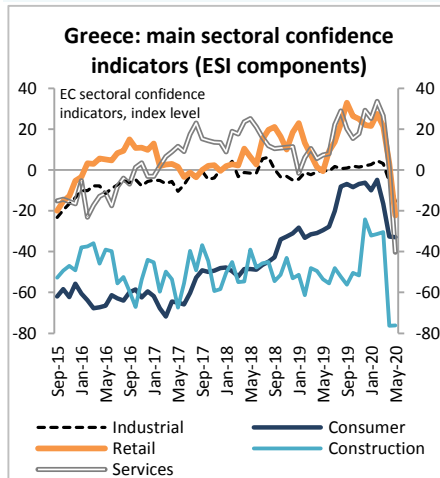
Nonetheless, it should be stressed that the unique nature of the Covid-19 shock affects the signals from economic variables, due to unprecedented actions by firms and individuals, which, in turn, affect data compilation processes. Unlike most recessions – when activity starts to slow in the quarters preceding the recession, with high frequency indicators gradually responding to the downturn – the economic impact of the shock occurred suddenly in the last two weeks of Q1:2020 (while it is expected to escalate in early-Q2:2020) providing limited response time for economic indicators to adjust to the new conditions. Moreover, distortions from the still high uncertainty and the increasing weight of tourism in macroeconomic developments in the period May-September warrant caution in the interpretation of indicator signals.

A characteristic example of the above-mentioned effects is visible in the Labor Force Survey data for Greece, as well as for other euro area countries, in March 2020. In fact, the contraction in employment was relatively mild (-0.3% y-o-y) and has been accompanied by a surprising fall in the unemployment rate to a 9-year low of 14.4% in March. This outcome reflects a sudden increase in the non-active population (5.4% y-o-y, in seasonally adjusted terms), due to Covid-19 related constraints in searching for jobs and the statistical classification as “employed” of all individuals under an employment contract suspension up to 3 months. In this respect, it is becoming increasingly challenging to extract valuable information on activity trends on the basis of well-established economic indicators. An effective combination of a variety of information sources is becoming highly important to minimize biases and distortions.

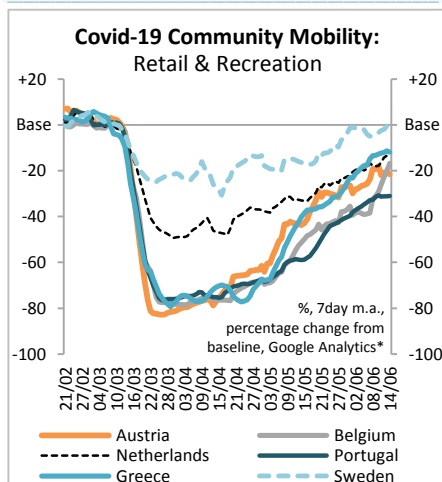
Moreover, it is widely known that the timeliness of some economic variables must be weighed against their other properties. Indeed, survey data (such as the European Commission’s/IOBE economic sentiment indicator and its components, and manufacturing PMI) provide valuable information on economic conditions, on a monthly frequency and with a high degree of granularity. Nonetheless, survey data usually overreact in periods of extreme uncertainty and thus a



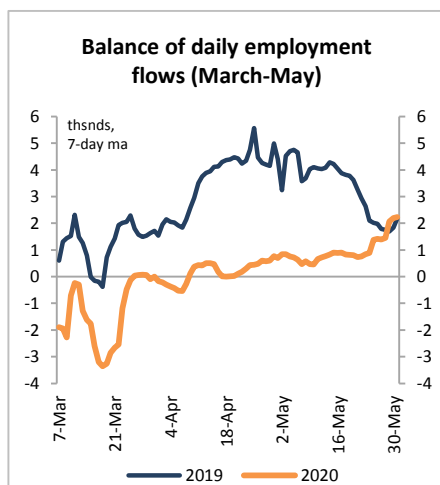
Survey data and conjunctural indicators available for April and May 2020 point to a further drop in activity



Greece exhibits a relatively fast improvement in mobility, in response to the gradual lifting of the lockdown...



...which is also confirmed by the daily flows recorded in the Ergani Information System



potential mapping of survey outcomes to economic activity trends should be filtered using additional information.

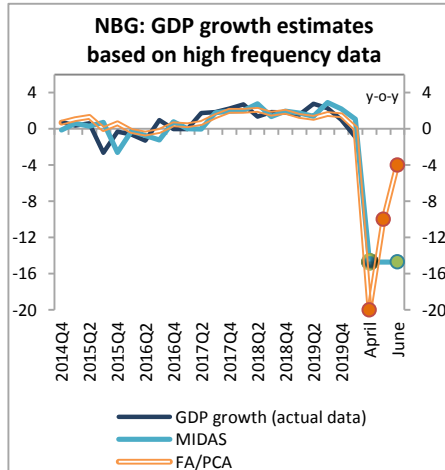
Similarly, mobility indicators that succeeded in capturing the timing and severity of the downturn in March should also be interpreted with caution and in conjunction with other HF indicators in assessing the strength of the recovery, as uncertainty fades and restrictions are lifted. Indeed, citizens' mobility trends – even subcomponents referring to more specific activities, such as visits to retail and recreation places – have an indirect relation to final spending, which is a latent variable. Furthermore, there is still limited information regarding their correlation with activity and sales developments during the economic upturn, due to the unavailability of data for a longer time-period and the absence of seasonal adjustment.

Bearing that in mind, the NBG Economic Analysis Division, in response to the need for tools to monitor the rapid evolution of economic conditions at the onset of the pandemic and to effectively summarize the information included in a broad set of economic indicators, employed two distinct but complementary statistical methods that are considered appropriate for this purpose. The first is based on factor analysis (FA) of Greek GDP estimated at a monthly frequency using inputs derived from a “principal component analysis (PCA)” of a broad set of high frequency indicators (including consumer and business survey data, fiscal, current account and banking data, google mobility reports data, international arrivals at the Athens International Airport, electricity consumption, retail sales, manufacturing production, capacity utilization, business turnover and indicators of international activity especially in the EU). This technique aims at summarizing the information from several series into a limited set of the most relevant variables – taking into account the co-variance of the data – and using this input to forecast economic activity in high frequency.

The second approach is based on a “mixed frequency regression (MIDAS)” estimation that expresses quarterly GDP as a function of a smaller set of more timely available indicators with different frequencies, which are also included in the broader dataset of the above mentioned FA/PCA approach.

The results obtained by the first approach, which projects economic activity on a monthly basis, point to a drop in monthly activity of 21.0% y-o-y in April. Preliminary estimates for May and June – that incorporate a subset of available survey, mobility and bank transaction data – point to a significant slowing in GDP

Preliminary estimates for May and June point to a significant slowing in GDP contraction to -10.0% y-o-y and -4.7% y-o-y, respectively



to -10.0% y-o-y and -4.7% y-o-y, respectively. These figures correspond to an annual GDP contraction in Q2:2020 of about 12.0% y-o-y, which is consistent with our projection for a recovery in GDP in H2:2020 with positive s.a. q-o-q changes of 7.1%, on average, in Q3 and Q4:2020. The final GDP outcome for Q2 will depend on the sustainability of domestic demand recovery, since the inclusion of tourism data for May and June will possibly weigh on updated GDP estimates for this period.

The second approach, producing estimates of annual growth in quarterly GDP, presages a contraction of about 15.0% y-o-y in Q2:2020, with the projected rate of decrease slowing as new data releases are incorporated in the estimates for this period. Indeed, the respective estimates of Q2 GDP, based on data available in late-May, pointed to an annual decrease higher than 18% y-o-y in the same quarter – on the basis of data available at that date.

The above-described estimates provide the first signs that the sharp shrinkage in economic activity caused by the pandemic, bottomed out in mid-May, with the additional improvement in June suggesting that the Greek economy has turned the corner. It should be stressed that economic sentiment has not yet responded to the fiscal stimulus measures, whereas the current assessment of tourism sector prospects in survey data used in the projection remains extremely conservative.

Greece: GDP Growth Decomposition & Outlook (forecasts for 2021 exclude the impact of "EC Recovery Fund")													
	2017	2018	2019	2020f	2021f	2019				2020			
						Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
GDP (real, % y-o-y, s.a.)	1,4	1,9	1,9	-7,5	5,1	1,6	2,8	2,3	1,0	-0,9	-15,1	-11,6	-2,4
GDP (real, % q-o-q, s.a.)	...	...	...	...	...	0,2	1,0	0,4	-0,7	-1,6	-13,5	4,6	9,6
Domestic Demand (y-o-y)	1,8	0,2	1,1	-5,9	4,6	3,2	2,4	-1,8	0,7	-1,6	-10,0	-8,5	-3,4
Final Consumption (y-o-y)	0,7	0,3	1,0	-4,5	2,6	0,3	1,9	0,6	1,1	0,1	-6,1	-6,8	-5,0
Private Consumption (y-o-y)	0,9	0,9	0,7	-8,7	5,9	1,3	0,0	0,3	1,3	-0,7	-18,3	-10,3	-5,6
Public Consumption (y-o-y)	-0,5	-2,5	2,2	9,8	-6,2	0,4	9,8	0,1	-1,4	2,0	29,6	7,0	-1,0
Gross Fixed Cap. Formation (y-o-y)	9,4	-12,0	4,5	-13,6	18,0	8,8	-5,2	2,5	14,0	-6,4	-22,0	-15,0	-11,0
Inventories* (contribution to GDP)	0,1	1,5	-0,3	-0,4	0,5	2,0	1,4	-2,6	-1,8	-1,0	-2,1	-0,9	2,3
Net exports (contribution to GDP)	-0,4	1,7	0,8	-1,6	0,4	-1,7	0,4	4,1	0,3	0,8	-5,1	-3,1	1,0
Exports (y-o-y)	6,9	8,7	4,9	-23,0	13,5	4,8	5,2	9,1	0,7	2,5	-48,4	-30,5	-14,9
Exports of goods (y-o-y)	5,6	8,4	2,2	-1,4	7,9	-0,4	4,0	6,5	-1,1	4,7	-12,0	-2,5	4,5
Exports of services (y-o-y)	8,3	9,2	8,1	-48,2	26,5	10,3	6,9	13,7	1,9	0,0	-92,0	-63,0	-36,0
Imports (y-o-y)	7,4	3,0	2,5	-18,2	11,4	9,7	3,9	-2,7	-0,3	0,2	-33,0	-22,0	-18,0

*also including other statistical discrepancies / Sources: EL.STAT. & NBG estimates



High frequency indicators used in estimating GDP growth

	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20																											
PMI (index level)	55,2	56,1	55,0	52,9	54,2	53,5	53,5	53,9	53,6	53,1	54,0	53,8	53,7	54,2	54,7	56,6	54,2	52,4	54,6	54,9	53,6	53,5	54,1	53,9	54,4	56,2	42,5	29,5	41,1																											
Industrial confidence (index level)	1,2	4,2	-3,3	-1,2	-1,5	-1,6	5,4	6,3	0,3	-3,4	-3,2	-5,0	-4,6	-1,2	-2,3	-0,9	-0,2	-0,6	1,7	0,6	1,0	1,9	1,4	2,0	2,7	4,5	3,1	-5,6	-15,4																											
Manufacturing production (y-o-y)	9,5	1,0	-1,8	3,4	0,6	1,5	7,2	1,5	1,8	0,1	8,5	1,4	-1,2	3,1	2,8	3,4	2,8	-0,1	-1,9	0,9	5,2	1,8	-6,9	0,7	4,4	-1,5	1,8	-11,3																												
Industrial production (y-o-y)	-0,4	-0,7	0,8	3,2	1,0	1,3	3,5	-0,3	3,3	0,0	5,2	2,3	3,9	1,6	-0,6	2,3	-0,6	-0,5	-2,1	0,0	1,8	-0,9	-9,6	-4,2	-0,8	-3,1	0,4	-9,9																												
Services confidence (index level)	8,9	18,9	17,7	23,6	25,1	21,0	15,9	11,9	10,5	10,7	11,1	11,4	-1,6	6,1	10,5	5,6	7,3	7,9	22,1	28,8	20,2	15,4	17,8	29,1	25,2	33,6	26,6	1,1	-40,3																											
Consumer confidence (index level)	-48	-50	-52	-49	-49	-49	-47	-45	-43	-34	-33	-31	-28	-33	-32	-31	-30	-28	-20	-8	-7	-8	-7	-6	-10	-5	-17	-33	-33																											
Retail confidence (index level)	1,8	2,8	2,2	10,4	6,4	2,6	14,9	19,7	21,0	16,4	10,0	18,4	23,0	13,3	7,4	1,4	-0,7	9,2	13,7	22,6	32,9	26,3	25,0	22,0	21,5	27,5	21,3	3,2	-22,4																											
Retail trade volume (y-o-y)	1,0	-0,5	1,5	1,5	4,1	1,7	2,4	3,6	2,9	-4,1	3,0	-0,1	-3,2	-3,1	4,9	-2,5	-2,4	2,4	-2,2	2,2	5,0	7,2	3,7	-1,5	6,2	2,5	-3,1																													
Construction Permits (y-o-y)	46	-15	-4	38	14	23	17	13	33	38	51	18	-9	-25	-20	1	6	1	22	38	60	-10	7	47	44	70	54																													
House prices (yoy, quarterly series)	0,5	0,5	0,5	1,3	1,3	1,3	2,3	2,3	2,3	3,2	3,2	3,2	5,5	5,5	5,5	7,6	7,6	7,6	8,3	8,3	8,3	7,6	7,6	7,6	6,9	6,9	6,9																													
Construction confidence (index level)	-50	-45	-55	-55	-39	-48	-46	-45	-55	-51	-43	-53	-51	-61	-48	-50	-54	-56	-48	-52	-56	-50	-52	-24	-32	-31	-31	-76	-76																											
Employment (y-o-y)	3,2	0,8	1,8	1,6	2,0	2,0	2,0	1,7	2,0	2,4	2,4	2,6	2,1	2,8	2,3	2,7	2,5	2,3	1,8	2,2	1,9	1,4	1,8	1,2	0,9	0,5	-0,3																													
Interest rate on new private sector loans (CPI deflated)	5,2	4,4	4,8	4,5	3,9	3,4	3,9	3,7	3,7	3,2	3,6	4,1	4,5	3,9	3,6	3,9	4,4	4,8	4,5	4,9	4,7	5,0	4,1	3,6	3,5	4,1	4,1	5,5																												
Credit to private sector (y-o-y)	-0,8	-0,9	-1,0	-1,9	-1,9	-1,2	-1,5	-1,5	-1,2	-1,4	-1,4	-1,1	-1,1	-0,6	-0,6	-0,1	-0,2	-0,2	-0,1	-0,1	-0,5	-0,2	-0,2	-0,6	-0,6	-0,8	0,1	0,3																												
Deposits of domestic private sector (y-o-y)	4,9	5,6	6,3	7,2	7,4	7,5	7,4	7,3	7,4	6,2	5,9	6,3	6,2	5,5	5,5	6,0	5,7	6,0	6,5	6,2	5,8	6,5	6,5	6,7	6,3	7,7	8,8	8,6																												
Interest rate on new time deposits (households, CPI deflated)	0,8	0,5	0,9	0,6	0,0	-0,4	-0,2	-0,4	-0,5	-1,2	-0,4	0,0	0,2	0,0	-0,4	-0,4	0,3	0,8	0,5	0,7	0,5	1,1	0,1	-0,4	-0,5	0,1	0,3	1,7																												
Economic sentiment index (EU Commission, Euro area)	114	114	112	113	112	112	112	111	111	110	110	108	106	106	105	104	105	103	102	103	101	100	101	101	103	103	94	65	68																											
Exports (excl. oil & shipping, y-o-y, 6m mov.avg)	11,2	11,4	11,7	11,6	11,6	12,2	11,3	11,7	11,3	11,4	11,9	9,6	7,9	7,4	6,3	6,0	5,6	4,7	5,2	3,9	5,5	4,2	2,4	4,7	5,6	6,3	4,2	1,3																												
Imports (excl. oil & shipping, y-o-y, 6m mov.avg)	8,1	7,6	7,5	6,6	5,6	7,7	7,9	9,2	10,1	12,4	12,2	10,8	9,5	8,9	7,8	5,6	7,5	5,6	6,0	3,7	4,4	2,1	-0,5	0,7	0,5	1,4	-1,7	-4,4																												
SETE - Arrivals at major Greek airports (y-o-y)	16,5	23,7	37,9	9,1	23,1	14,6	9,6	8,3	10,2	7,8	29,0	23,9	10,4	17,8	-0,2	18,7	-0,2	2,0	1,4	4,4	1,3	5,7	18,5	7,8	8,3	2,5																														
AIA - International passenger traffic development (y-o-y)	11,8	15,7	18,2	15,7	18,1	14,4	12,4	14,0	11,9	12,7	13,5	8,7	8,7	11,6	9,3	9,3	8,4	10,2	6,9	8,2	8,6	7,2	6,6	10,9	10,2	6,4	-62,0	-99,2	-98,4																											
Egani net flows (s.a. series, in thousands)	16,5	8,9	19,7	13,5	18,5	11,2	9,8	10,4	10,7	7,7	12,2	12,4	9,5	14,9	9,6	18,7	7,9	10,1	8,3	13,9	9,8	8,3	11,5	8,4	13,2	10,9	-75,4	-79,3	-71,0																											
Estimation of total electricity demand in the network (y-o-y)	-11,4	-2,1	-0,1	-1,1	2,2	-0,1	-3,7	-5,3	2,2	0,7	-1,5	6,0	10,2	6,7	1,3	8,1	-1,3	6,0	3,4	10,0	0,7	-0,1	-6,8	-6,2	-3,2	-1,5	0,3	-6,9																												
VAT on other goods & services (y-o-y)	-5,7	1,2	-8,7	-1,1	-21,9	0,2	7,1	-7,4	67,8	-4,0	-4,0	-6,9	4,4	9,7	14,2	-10,5	23,2	-2,1	3,6	1,1	1,3	-0,8	1,8	1,7	-0,8	1,1	-23,7	9,1																												
Business Turnover (y-o-y, double-entry bookkeeping)	--	--	--	--	--	--	--	--	--	--	--	--	3,7	19,1	-1,0	12,1	5,4	-5,1	6,4	2,4	2,6	-2,2	-2,6	-0,6	9,3	-3,8	-11,2	-32,2																												
Color map scale																																																								
	Rapid contraction								Moderate contraction								Slow contraction								Stabilization								Slow expansion								Moderate expansion								Rapid expansion							

Sources: NBG, BoG, ELSTAT, Ministry of Finance, Ministry of Labor & Social Affairs, EU Commission, IOBE, SETE, AIA, ADMIE

Google mobility indicators for Greece

	February		March				April				May				June													
	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2												
Retail and recreation (percentage change from baseline)	2	5	-1	-26	-64	-79	-75	-71	-76	-68	-57	-39	-35	-27	-15	-12												
Grocery and pharmacy (percentage change from baseline)	1	15	-4	11	-4	-33	-23	0	-17	-2	-3	12	13	13	17	8												
Parks (percentage change from baseline)	7	24	27	0	-28	-63	-54	-35	-35	-10	20	62	63	46	67	86												
Transit stations (percentage change from baseline)	-1	5	-3	-22	-58	-77	-73	-67	-69	-60	-49	-33	-27	-24	-15	-17												
Workplaces (percentage change from baseline)	2	3	-7	-15	-45	-60	-56	-52	-61	-47	-42	-27	-22	-15	-9	-13												
Residential (percentage change from baseline)	0	-1	1	7	18	26	24	22	24	19	16	10	7	6	3	2												
Difference* from the baseline in per cent ▶▶▶▶▶	1	4	-4	-21	-56	-72	-68	-63	-69	-58	-49	-33	-28	-22	-13	-14												
Color map scale																												
	Rapid contraction				Moderate contraction				Slow contraction				Stabilization				Slow expansion				Trend growth				Above trend			

*Aggregate indicator corresponds to the average of 3 main categories: retail & recreation, transit stations, and workplaces.

Sources: Google COVID-19 Community Mobility Reports, NBG estimates



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The analysis is based on data up to June 19, 2020, unless otherwise indicated