BBVA Research

Tracking Sectoral GDP with Big Data and Nowcasting Models

April 2025

Creating Opportunities

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Key messages

- We have started to produce big data supply indicators to monitor real time economic activity in sectoral detail with high frequency and granular data through turnover transactions of Garanti BBVA customers.
- We also integrate our big data sectorial indicators in nowcasting models together with other relevant high frequency data in order to enhance the accuracy of our analysis on sectoral economic activity.
- In backtests using our full sample, our nowcasts for the industry and services sectors show relatively stronger performance, while the construction sector exhibits greater volatility.
- Since industry and services account for approximately 80% of non-agricultural output, our aggregated GDP nowcast closely mirrors official data, offering a robust early signal.
- Given the high frequency data so far, we nowcast nearly 3% y/y non-agricultural GDP growth for 1Q25, with services making a notably strong contribution.

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01

Garanti BBVA Supply Side GDP Indicators

Methodology

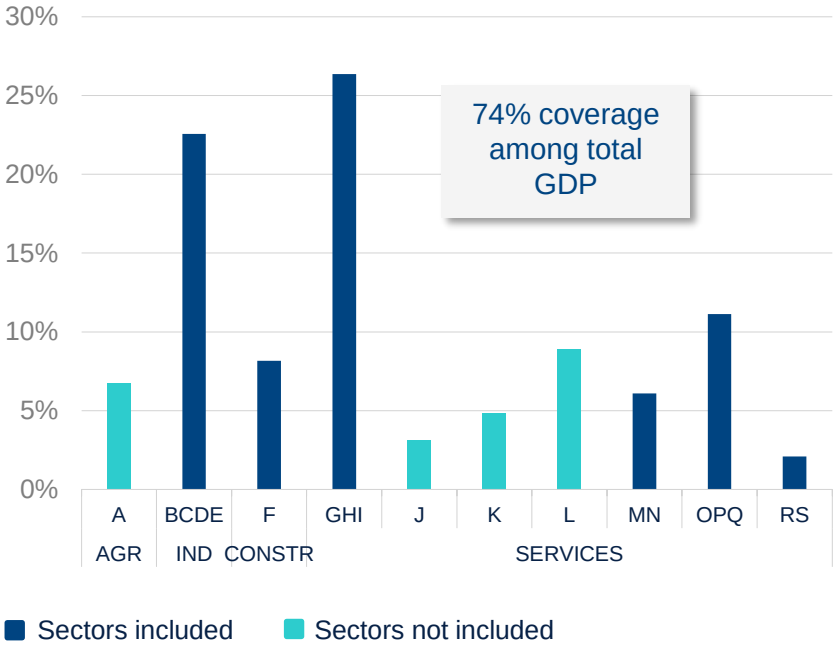
- In order to monitor economic activity in sectoral detail with high frequency and granular data, we have developed big data supply side indicators tracking real time GDP growth from the production side.
- In terms of data source, among the universe of Garanti BBVA customers, we have used turnover transactions since 2014 received by the firms who are identified with a NACE code* showing their sectorial segmentation.
- We filter out transactions in 2-digit NACE sectors for our big data proxies, considering the trade-off between their broader coverage and stronger model fit.
- We use different set of price deflator series, depending on the goodness of fit with employed frequency conversion methodologies, when needed.
- We finally produce real time sectoral production indices by means of weighted and aggregated deflated levels according to corresponding price deflators and official sector-level weights.

** the industry standard classification system used in the European Union*

We attain 74% coverage within national accounts, observing heterogeneity across sub-segments driven by sector selection and fit quality

GDP SHARES BY VOLUME

2023



Source: TURKSTAT

SUB-COMPONENT SHARES IN SECTORS

%, by NACE

Our big data sectoral proxies closely match official turnover indices in major industrial sectors, with a coverage rate of 65%*

INDUSTRY TURNOVER: GARANTI BBVA VS. TURKSTAT

% YOY, NOMINAL

Mining of metal ores

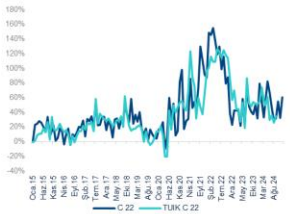
Other mining

Food & beverages

Textiles

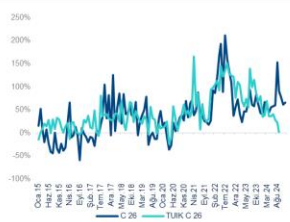
Paper

Printing & media



Rubber & plastic

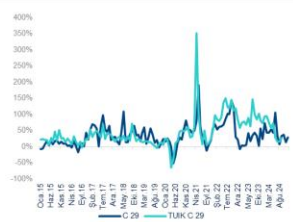
Non-metallic mineral



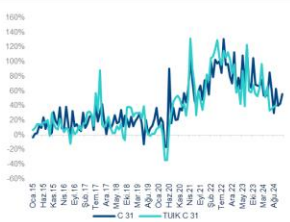
Basic metals

Fabricated metal

Machinery & equipment



Electrical machinery



* 65% of industry sub-component NACE sectors are selected to construct a proxy for the aggregate industry

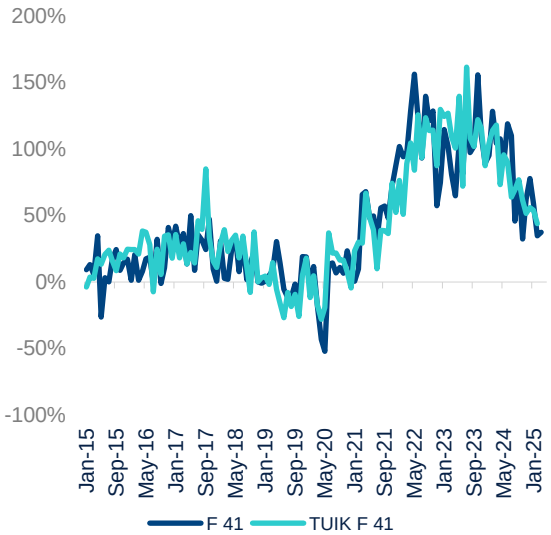
Source: BBVA Research, TURKSTAT

The fit in construction sub-sectors shows greater volatility, especially in civil engineering activities linked to public infrastructure

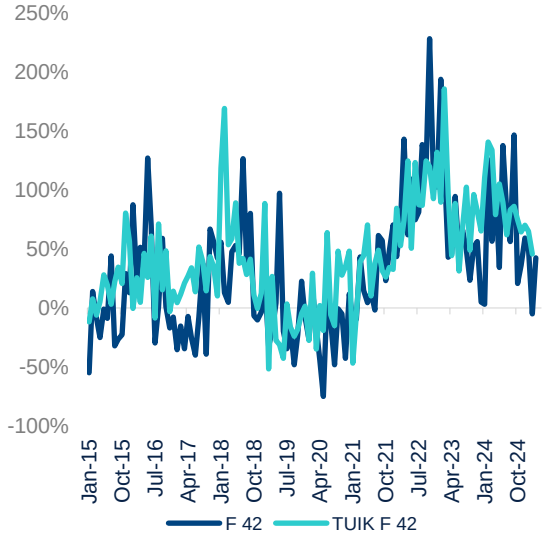
CONSTRUCTION TURNOVER: GARANTI BBVA VS. TURKSTAT

% YOY, NOMINAL

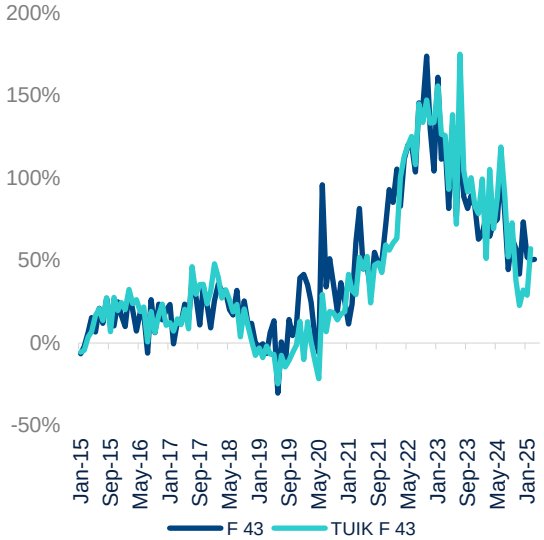
Construction of buildings



Civil engineering



Specialised construction activities



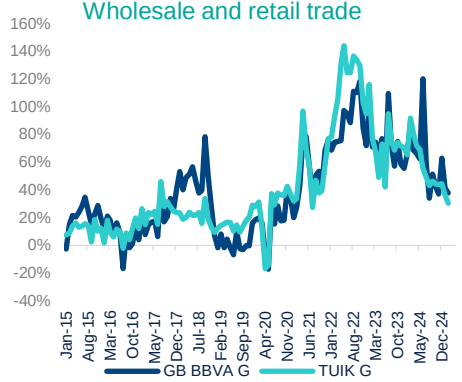
Source: BBVA Research, TURKSTAT

We achieve 75% coverage of the services sector, with notably accurate tracking in its major components

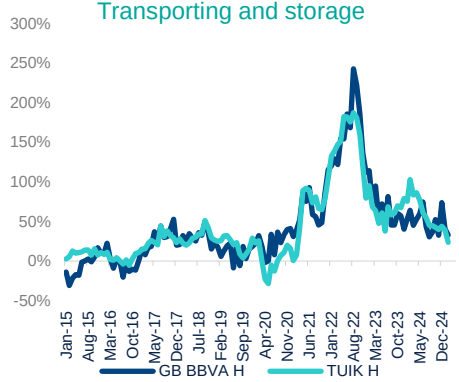
SERVICES TURNOVER: GARANTI BBVA VS. TURKSTAT

% YOY, NOMINAL

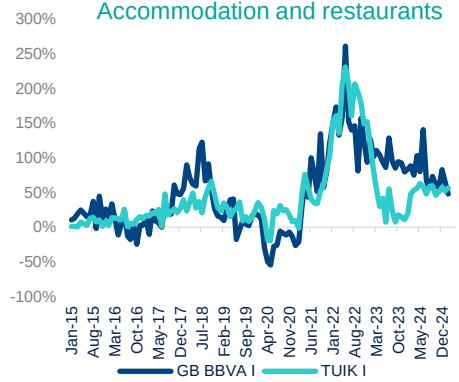
Wholesale and retail trade



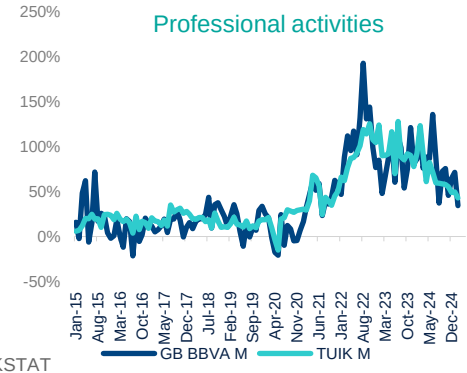
Transporting and storage



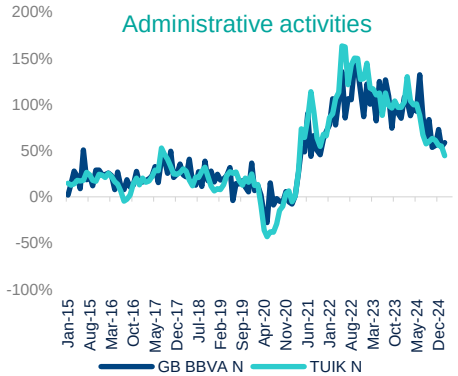
Accommodation and restaurants



Professional activities



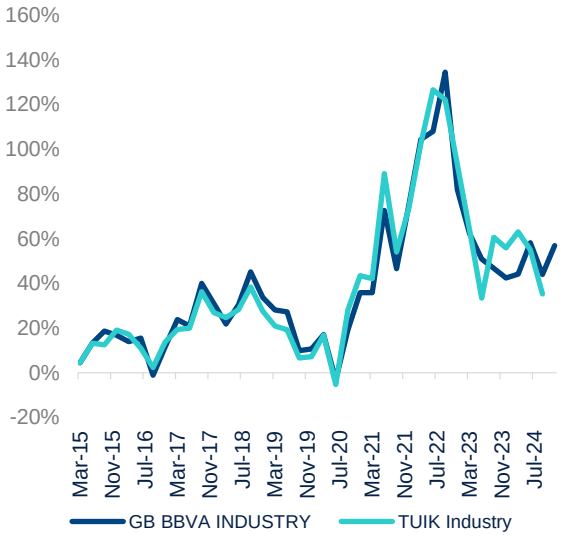
Administrative activities



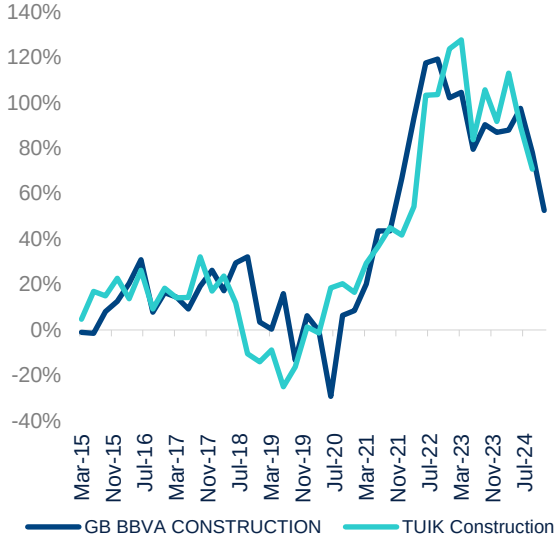
Source: BBVA Research, TURKSTAT

Our final aggregation of big data supply indicators is based on the official weighting of each sector

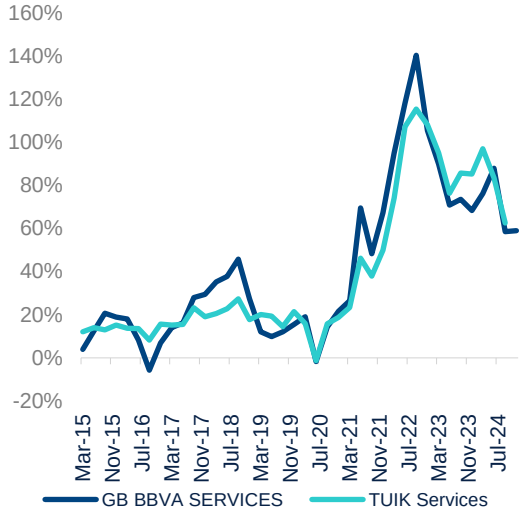
INDUSTRY
% YOY, NOMINAL



CONSTRUCTION
% YOY, NOMINAL



SERVICES
% YOY, NOMINAL



Source: BBVA Research, TURKSTAT

We apply sector-specific deflators and generate our own deflator nowcasts to interpolate monthly values within each quarter

Construction: Construction GDP Deflator (aggregate)

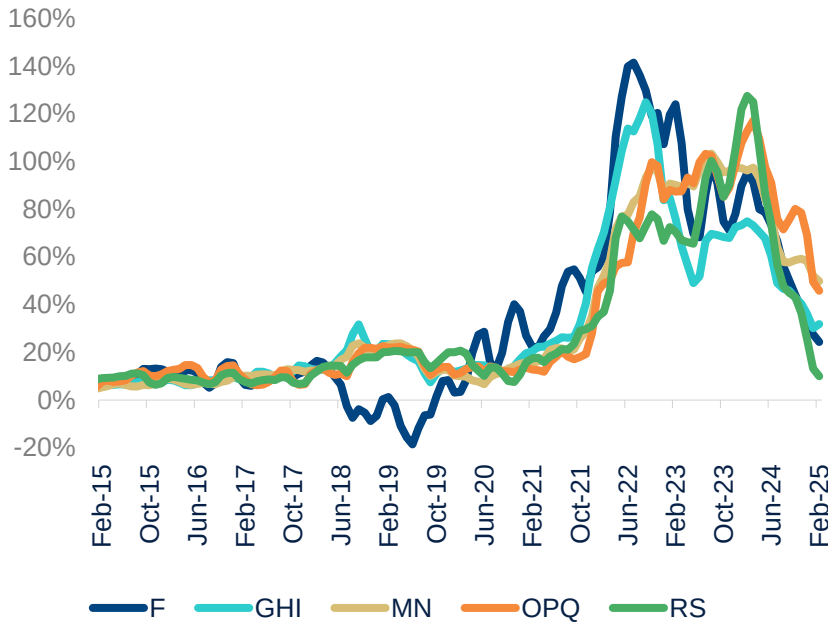
Industry: PPI sub-items

Services: Services GDP Deflators (for each subgroup)
GHI MN OPQ RS

For quarterly GDP deflators:

- Convert to monthly frequency with additional high frequency (HF) price indicators with Fernandez (1981) methodology
- Extrapolate for the months in the current quarter with the same HF indicators as well

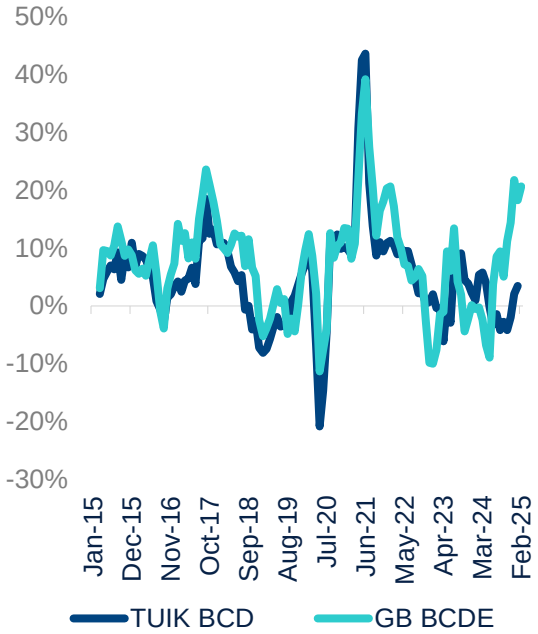
GDP DEFLATOR NOWCASTS
(%, YOY)



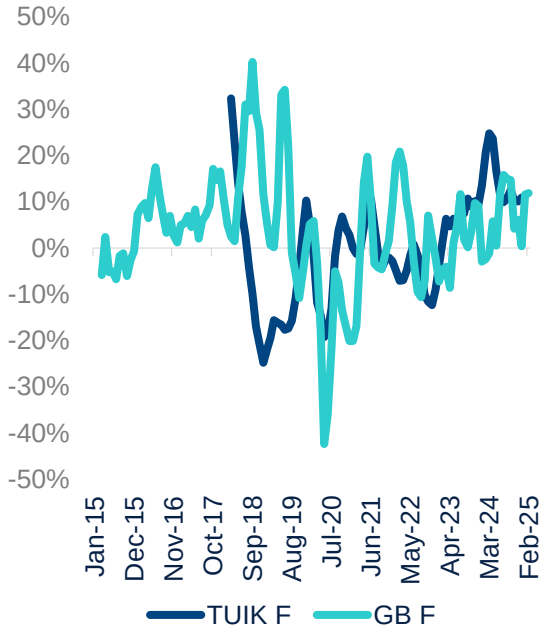
Source: TURKSTAT, CBRT & Garanti BBVA Research.

Nominal big data supply indicators are adjusted using the corresponding deflator nowcasts, enabling us to estimate sectoral production in real terms

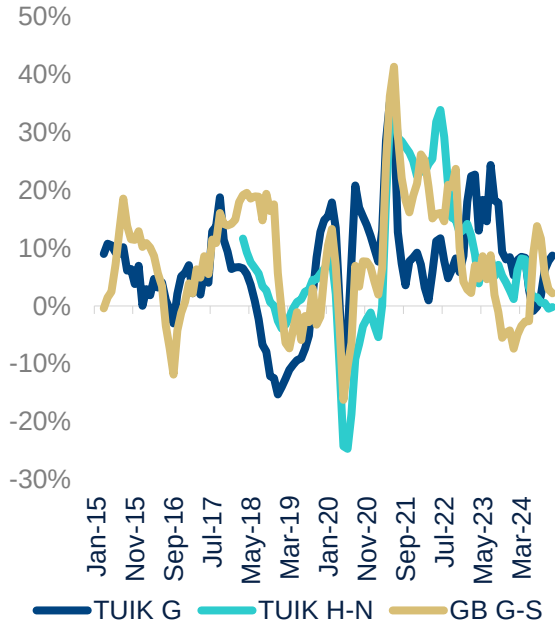
INDUSTRY
% YOY*, REAL, 3MA



CONSTRUCTION
% YOY*, REAL, 3MA



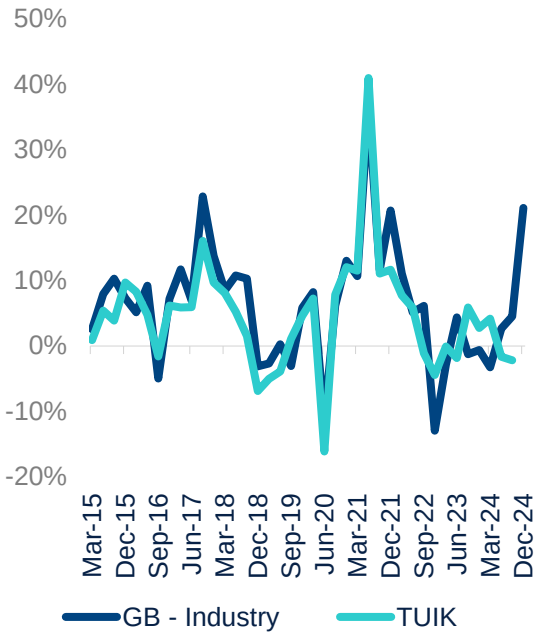
SERVICES
% YOY*, REAL, 3MA



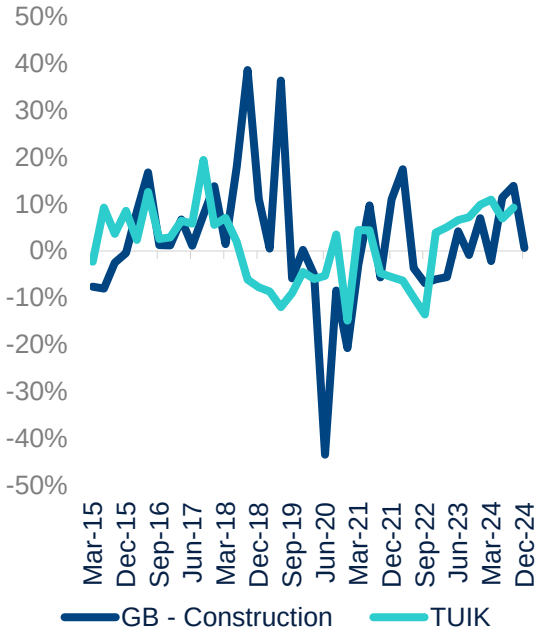
* Sectoral real production indices are used as official benchmarks for each sector
Source: BBVA Research, TURKSTAT

Our estimates also align well with official sectoral value-added figures, with construction showing more pronounced fluctuations

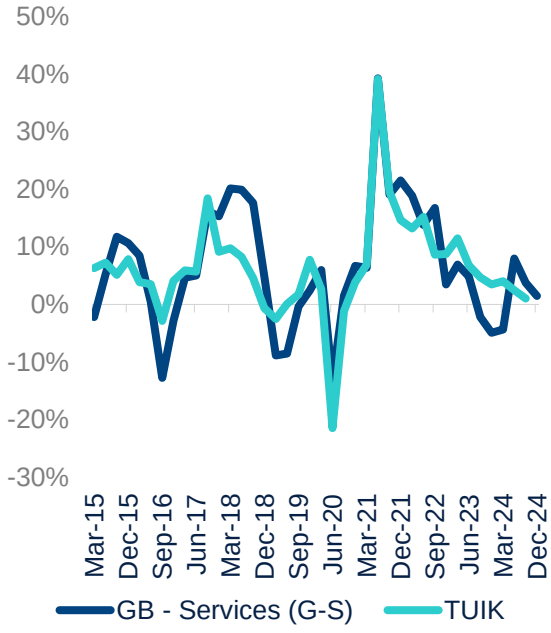
INDUSTRY
% YOY, REAL, 3MA



CONSTRUCTION
% YOY, REAL, 3MA



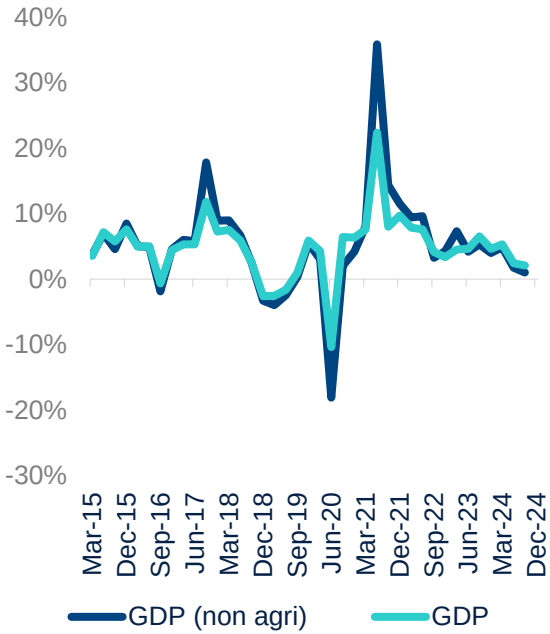
SERVICES
% YOY, REAL, 3MA



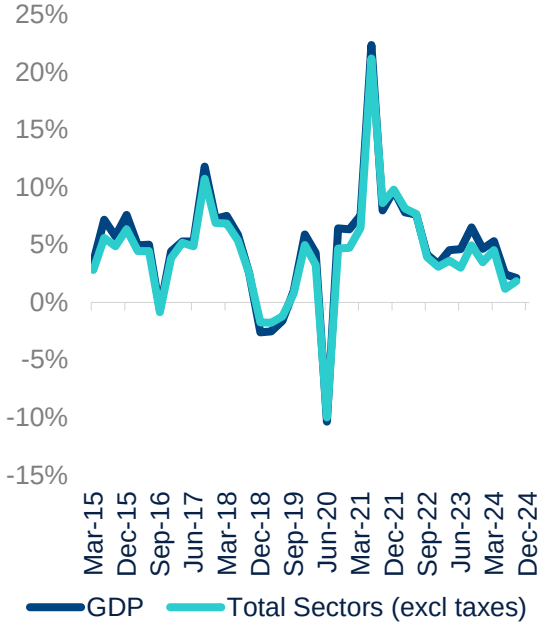
Source: BBVA Research, TURKSTAT

Our non-agricultural GDP estimate is then aggregated, though further refinement requires integrating more high-frequency inputs

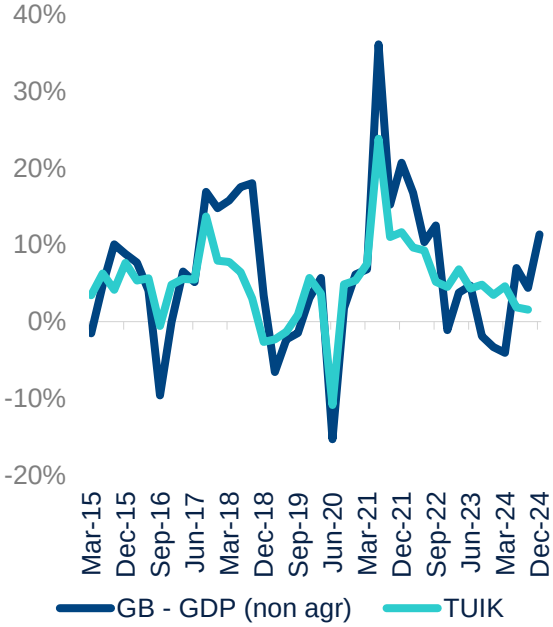
TUIK: GDP VS NON AGR GDP
% YOY, REAL



TUIK: GDP VS GDP EXCL TAXES
% YOY, REAL



TOTAL GDP: GARANTI BBVA VS TUIK
% YOY, REAL, NON-AGRICULTURAL



Source: BBVA Research, TURKSTAT

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02

Garanti BBVA Sectorial GDP Nowcasts

Methodology

- In order to increase the accuracy of tracking sectorial economic activity, we integrate our big data sectorial indicators in nowcasting models together with other relevant high frequency data.
- Among a wide set of macroeconomic and financial variables, we use several variable selection methodologies to choose a variable set for each sectorial nowcast model, considering also the timeliness of each variable.
- We use Mixed Frequency Dynamic Factor Models, following the work of Banbura & Modugno (2014) for nowcasting exercises.
- We perform backtest exercises at different points in a quarter with pseudo-real time data, showing the increasing model performance as the data accumulates.

We leverage a broad set of sector-specific variables to identify optimal combinations for our sectoral nowcasts

FULL LIST USED IN VARIABLE SELECTION

Industry	52 variable
Turnover	NACE B-C (31 variables)
Production Index	Ind Production Index
Loans	Minery_loans
	Manufaturing_loans
	Electricity_gas_loans
	Total_fx_adj_loans
Survey	Real Sector Confidence
	Total_orders
	Goods_stock
	Production_volume
	Total_employment
	Orders
	Export_orders
	Investment
	Genaral_outlook
	Capacity Utilization
	PMI
Electricity	Electricity_Prod
	Electricity_Cons
Imports (Int Good)	Int_Good_Imp
	Int_Good_Imp_Volume
Big Data	Industry Index

Construction	41 variable
Turnover	NACE C23
	NACE C24
	NACE C25
	NACE F. (Construction)
	NACE F41. (Buildings)
	NACE F42. (Civil Engineering)
	NACE F43. (Spec Constr Activities)
House Sales	House Sales - Total
	House Sales - Mortgage
	House Sales - First Hand
	House Sales - Second Hand
Occupancy Permit	Buildings (number)
	Buildings (square meter)
	Buildings (nominal value)
	Buildings (number of apartments)
Construction Permit	Buildings (number)
	Buildings (square meter)
	Buildings (nominal value)
	Buildings (number of apartments)
Loans	Consumer – Mortgages
	Construction Sector – Cash Loans
	Construction Sector – NonCash Loans
Survey	Construction Sector Confidence
	Construction Activities (3M)
	Construction activity constraints
	Prob of purchase / build a house
	Prob of repair a house
	IMSAD-Activity Index
	IMSAD-Composite Index
Production Index	Construction Production Index
Fiscal	Real Estate Production & Repair Costs
Big Data	Construction Index
	NACE 23

Services	85 variable
Turnover	NACE G-N (38 variables)
Loans	Total_fx_adj_loans
Production Index	NACE H-N (34 variables)
Retail Sales	Retail Sales Index
	Food
	Non_Food
	Fuel
Trade Volume Index	Trade_sales_volume
Survey	Retail Sales Confidence
	Trade Sales Confidence
Big Data	Services Index
	NACE GHI
	NACE MN
	NACE OPQ
	NACE RS

SELECTED VARIABLES USED IN NOWCASTING*

Industry	Construction	Services
Turnover NACE C	Turnover NACE F	Trade Sales Confidence
Industrial Production	Turnover NACE 41	Retail Sales - Fuel
Total Orders	Turnover NACE 43	Turnover NACE 59
Capacity Utilization Rate	Construction Production Index	Big Data Services
Electricity Consumption	Big Data Construction	Retail Sales - Non_Food
Big Data Industry	Construction_Conf_Repair	Serv Production Index (H-N)

*Soft Data and Big Data are indicated in light blue.

Various variable selection techniques are employed, incorporating our big data industrial proxy to enhance the industrial GDP nowcast

INDUSTRY NOWCAST - VARIABLE SELECTION

LASSO		LARS - Tibshirani (2004)		Camacho, Perez-Quiros (2010)	Correlation	
IP	0.71	IP	0.4669	IP	IP	0.98
Turnover C	0.17	Turnover 27	0.1011	Turnover BC	Total orders	0.93
Turnover 25	0.01	Turnover 25	0.0621	Turnover 13	Turnover C	0.90
		Electricity_prod	0.0612	Electricity_cons	Turnover BC	0.90
		Turnover 15	0.0548	Electricity_prod	Real Sector Confidence	0.89
		Turnover 16	0.0485	Turnover 23	Turnover 13	0.88
		Turnover 8	0.0297	Turnover 15	Total orders (3M)	0.88
		Turnover 21	0.0293	BigData_Industry	Investment_survey	0.87
		Turnover 12	0.0290	Export orders	Turnover 16	0.86
		Turnover C	0.0251	Total orders (3M)	Electricity_cons	0.86
		Turnover 31	0.0213	Turnover 19	Turnover 14	0.85
		Turnover 19	0.0178	Turnover 5	Capaticity Utilization	0.85
		BigData_Industry	0.0167	Turnover 12	Export orders	0.85
		Total_fx_adj_loans	0.0165		Employment_survey	0.84
		Turnover 13	0.0109		Turnover 22	0.84
		Turnover 14	0.0102		Electricity_prod	0.83
		Turnover 30	0.0089		Turnover 24	0.82
		Turnover 7	0.0071		Production_survey	0.81
		Total orders	0.0003		Turnover 25	0.80
Soft Data & Big Data		Total orders (3M)	0.0002		Turnover 20	0.78

Variables	Selection Count
IP	4
Turnover C	3
Turnover 25	3
Electricity_prod	3
Turnover 13	3
Total orders (3M)	3
Turnover 15	2
Turnover 16	2
Turnover 12	2
Turnover 19	2
BigData_Industry	2
Turnover 14	2
Total orders	2
Turnover BC	2
Electricity_cons	2
Export orders	2
Turnover 27	1
Turnover 8	1
Turnover 21	1
Turnover 31	1

The same methodology is applied to construction, utilizing distinct indicators across construction sub-sectors to improve accuracy

CONSTRUCTION NOWCAST - VARIABLE SELECTION

LASSO		LARS - Tibshirani (2004)		Camacho, Perez-Quiros (2010)	Correlation	
Turnover_25	0.22	Turnover_25	0.3064	Turnover_F	Turnover_41	0.88
Turnover_F	0.21	Turnover_F	0.1832	Constr_pr_index	Turnover_F	0.86
Const_conf_repair	0.12	Constr_pr_index	0.1468	Turnover_41	Turnover_43	0.84
Mortgages	0.09	Mortgages	0.1240	Turnover_42	Constr_pr_index	0.68
Turnover_41	0.08	Turnover_41	0.1027	Const_conf_limits	Budget_Exp_Real_Estate	0.67
OP_Apartments	0.05	Construction_loans_noncash	0.0944	Const_conf	Const_conf_12m_purchase	0.66
Const_conf	0.04	OP_Apartments	0.0473	Const_conf_repair	ConstCost_to_ppi	0.65
		BigData_Construction	0.0374	Turnover_25	Turnover_42	0.58
		House_Sales_1st	0.0311	CP_Buildings	Const_conf_limits	0.57
		BigData_23	0.0256	Construction_loans_cash	Const_conf_repair	0.57
		Budget_Exp_Real_Estate	0.0143	House_Sales_1st	Construction_loans_noncash	0.56
		Const_conf_repair	0.0045	BigData_23	Const_conf	0.55
		Turnover_43	0.0034	OP_m2	IMSAD-Composite Index	0.53
		IMSAD-Activity Index	0.0009	House_Sales_Mortgage	Const_conf_3M_activity	0.48
		Const_conf	0.0002		IMSAD-Activity Index	0.41
		Const_conf_3M_activity	0.0002		Turnover_25	0.40

Soft Data & Big Data

Variables	Selection Count
Turnover_F	4
Turnover_41	4
Const_conf	4
Const_conf_repair	4
Turnover_25	4
Constr_pr_index	3
House_Sales_1st	2
BigData_23	2
Mortgages	2
OP_Apartments	2
Turnover_42	2
Const_conf_limits	2
Construction_loans_noncash	2
Budget_Exp_Real_Estate	2
Turnover_43	2
IMSAD-Activity Index	2
Const_conf_3M_activity	2

We adopt a selective approach again, using our big data services proxy together with available hard and soft indicators for the services GDP nowcast

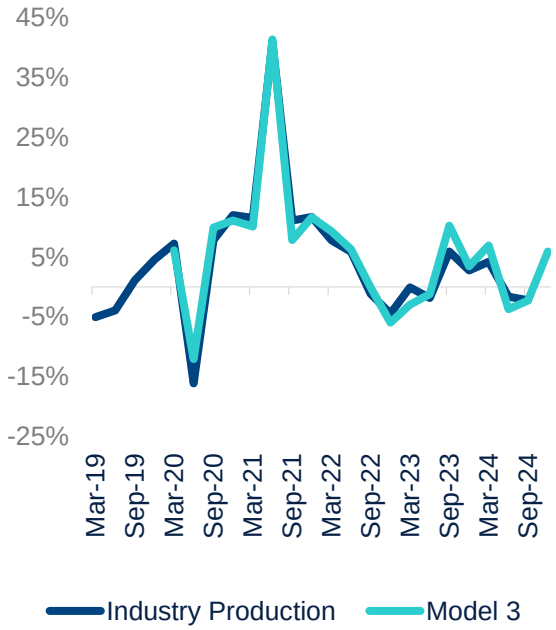
SERVICES NOWCAST - VARIABLE SELECTION

LASSO		LARS - Tibshirani (2004)		Camacho, Perez-Quiros (2010)	Correlation		Variables	Selection Count
Services Prod Index H-N	0.289	Turnover 59	0.223	Turnover HN	Services Prod Index 49	0.935	Services Prod Index 49	4
Services Prod Index 49	0.274	Services Prod Index M	0.220	Services Prod Index H-N	Services Prod Index H-N	0.925	Services Prod Index 59	4
Retail Sales - Fuel	0.084	Services Prod Index 59	0.204	Services Prod Index H	Services Prod Index H	0.906	Turnover 59	4
Turnover 59	0.072	Services Prod Index H-N	0.186	Services Prod Index 49	Services Prod Index 56	0.878	Services Prod Index 71	4
Services Prod Index	0.057	Retail Sales - Fuel	0.150	Turnover 49	Services Prod Index M	0.874	Services Prod Index H-N	4
Trade Sales Confidence	0.027	Services Prod Index 70	0.101	Services Prod Index 56	Turnover HN	0.865	Services Prod Index M	4
BigData_GHI	0.023	Turnover 46	0.087	Services Prod Index 82	Services Prod Index I	0.860	Trade Sales Confidence	4
Services Prod Index 71	0.015	Services Prod Index 71	0.081	Services Prod Index 69	Services Prod Index 82	0.860	Retail sales - Fuel	3
Services Prod Index 59	0.002	Services Prod Index H	0.071	Turnover 69	Turnover 59	0.852	BigData_GHI	3
		Retail Sales - Non_Food	0.064	Turnover 74	Services Prod Index 74	0.850	Services Prod Index H	3
		BigData_GHI	0.043	Services Prod Index M	Turnover I	0.847	Retail Sales - Non_Food	3
		Services Prod Index 49	0.026	Turnover M	Trade Sales Confidence	0.847	Turnover 46	2
		Trade Sales Confidence	0.011	Turnover 47	Services Prod Index 59	0.840	Turnover 47	2
				Services Prod Index 74	Services Prod Index 69	0.830	Turnover 49	2
				Turnover 59	Services Prod Index 55	0.827	Services Prod Index 56	2
				Services Prod Index 59	Services Prod Index 79	0.821	Services Prod Index 69	2
				Trade Sales Confidence	Turnover 56	0.819	Services Prod Index 70	2
				Turnover 71	Turnover 55	0.812	Services Prod Index 74	2
				Turnover G	Turnover 79	0.811	Services Prod Index 82	2
				Services Prod Index 71	Turnover 49	0.794	Turnover G	2
				BigData_Services	Services Prod Index 71	0.792	Turnover HN	2

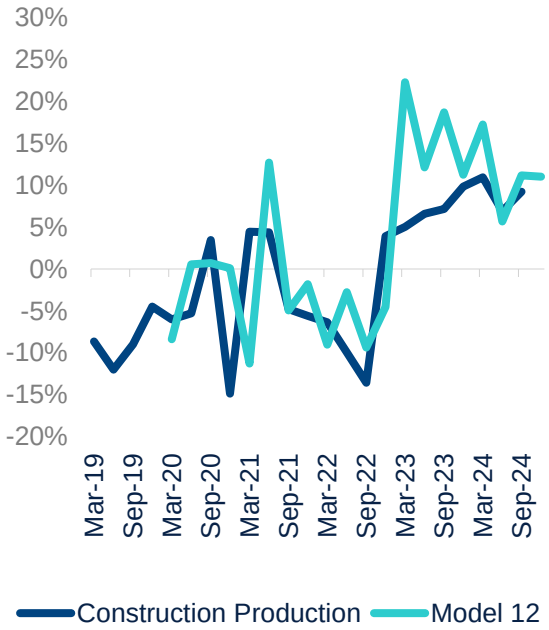
Soft Data & Big Data

In full-sample backtests, our industry and services GDP nowcasts perform better relative to the more volatile construction sector

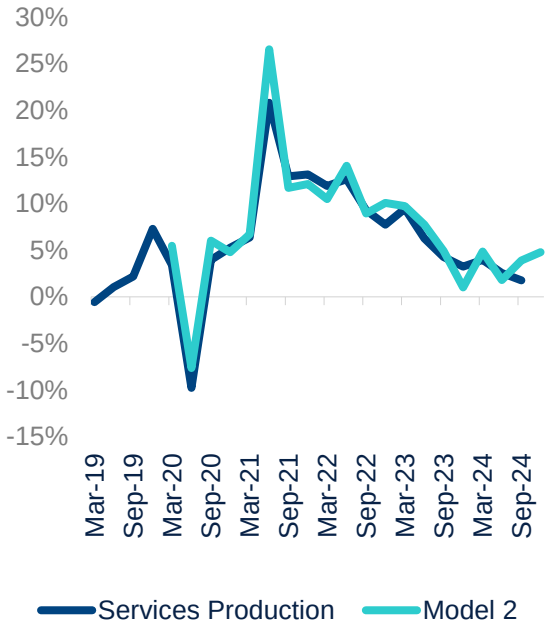
INDUSTRY
% YOY, REAL



CONSTRUCTION
% YOY, REAL



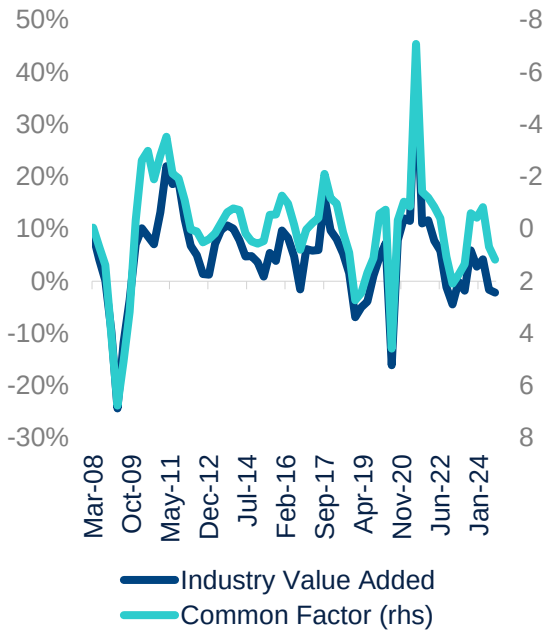
SERVICES
% YOY, REAL



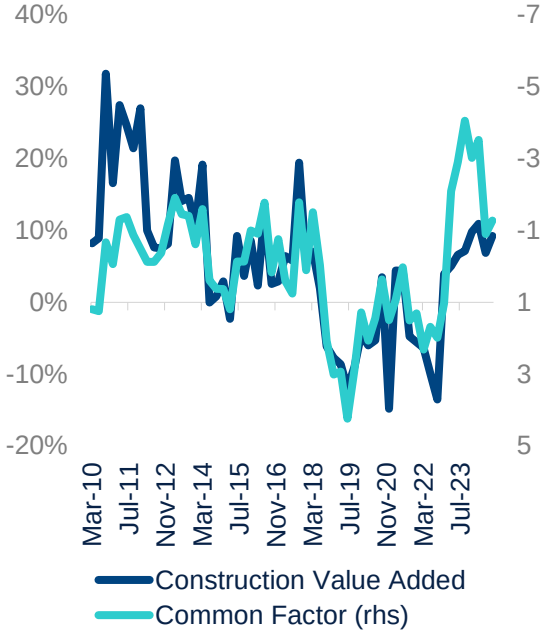
Source: BBVA Research, TURKSTAT

Model accuracy is highly sensitive to the amount of available input data, which drives the common factor*

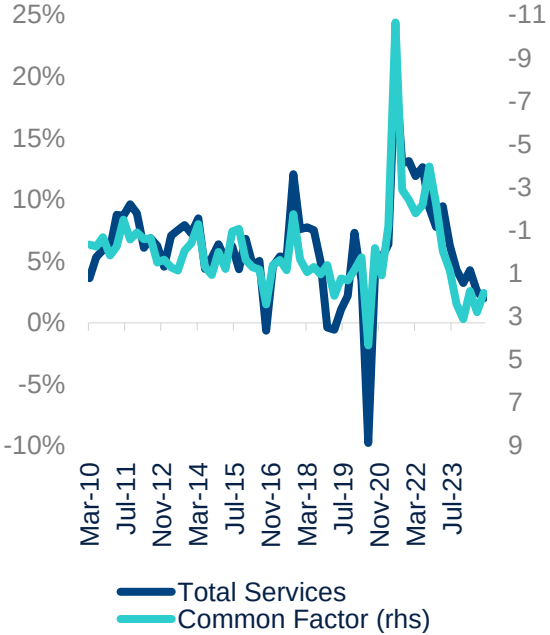
INDUSTRY
% YOY, REAL



CONSTRUCTION
% YOY, REAL



SERVICES
% YOY, REAL



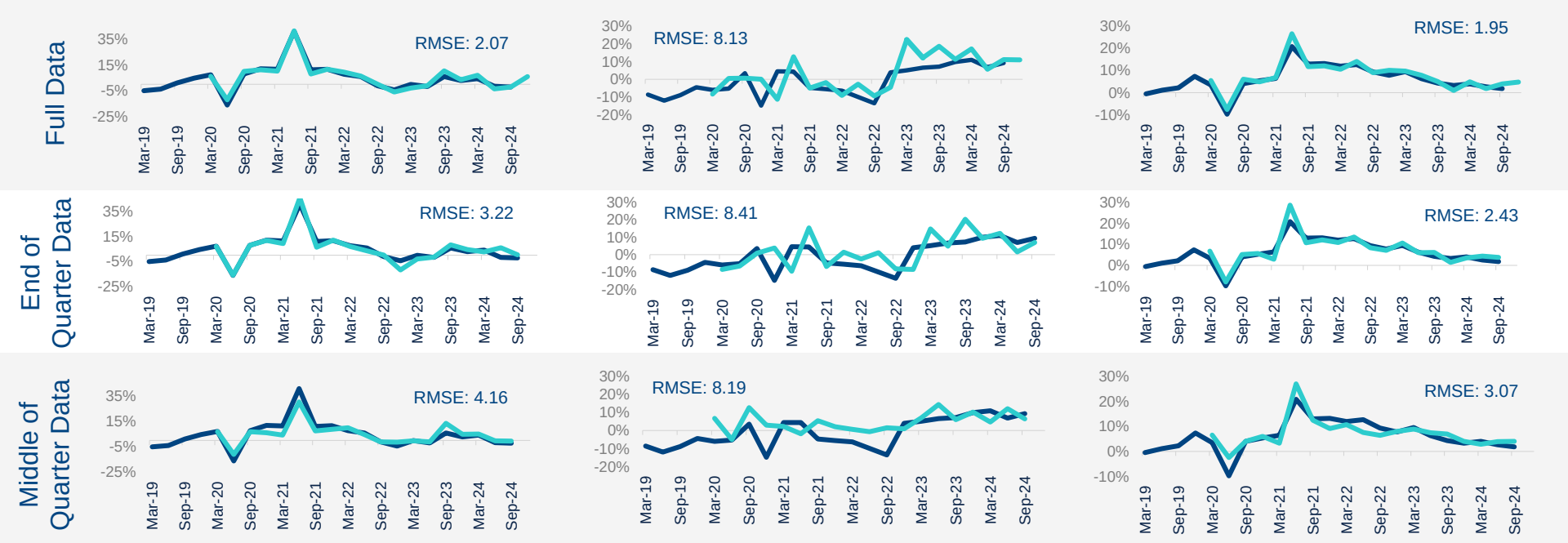
*Common factors are estimated with varible sets used in the final Dynamic Factor nowcast models, excluding the target GDP series

As expected, forecast errors decline over the quarter as more data becomes available - except in construction, where volatility persists

INDUSTRY
% YOY, REAL

CONSTRUCTION
% YOY, REAL

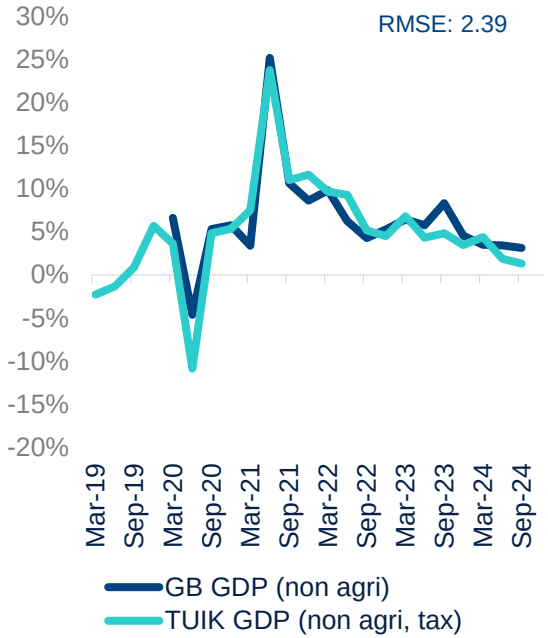
SERVICES
% YOY, REAL



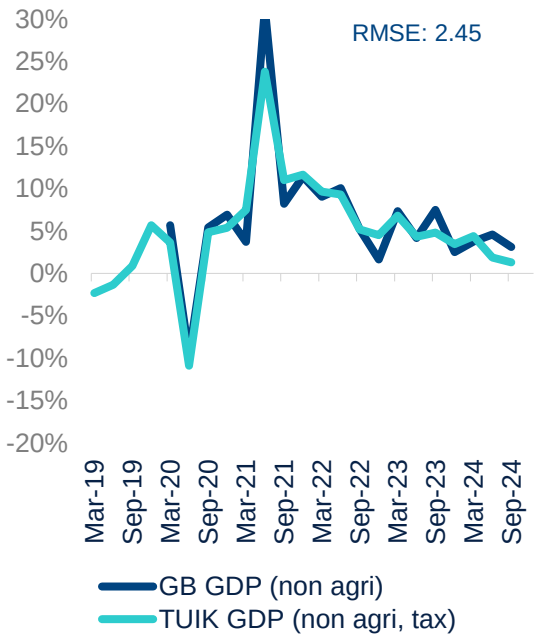
Source: BBVA Research, TURKSTAT

Since industry and services represent roughly 80% of non-agricultural output, our aggregate GDP nowcast closely reflects official figures

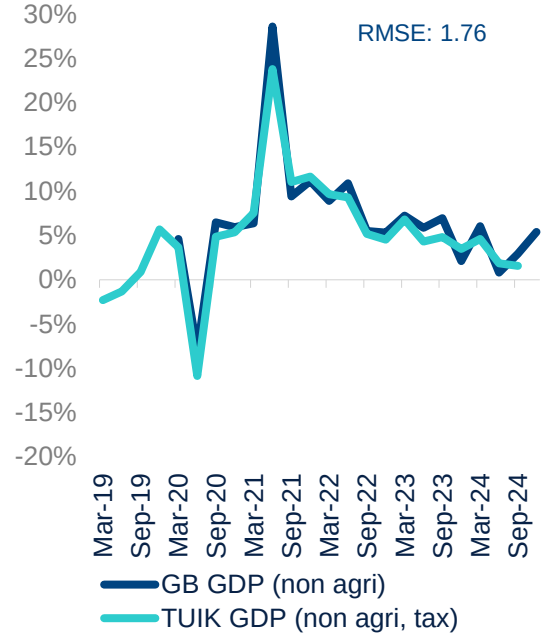
MIDDLE OF THE QUARTER DATA
% YOY, REAL



END OF THE QUARTER DATA
% YOY, REAL



FULL DATA
% YOY, REAL

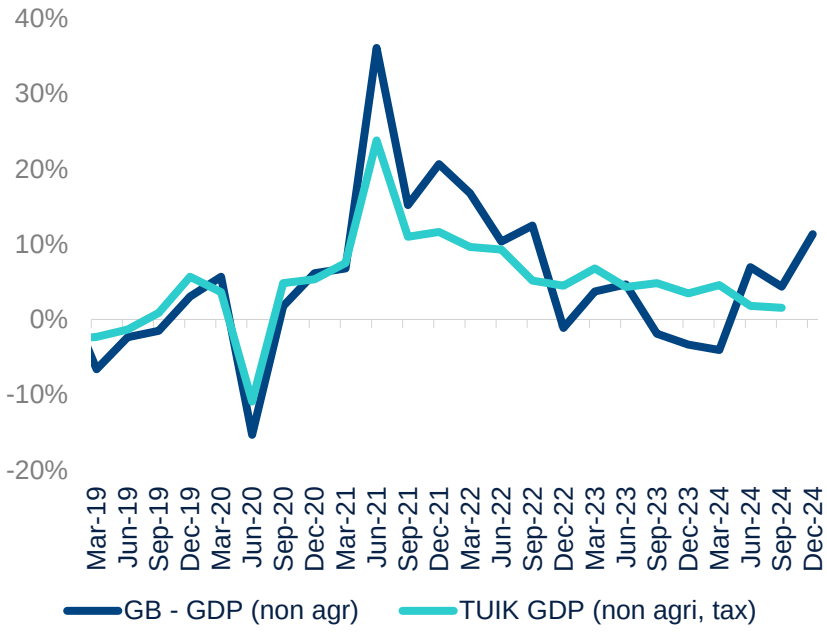


Source: BBVA Research, TURKSTAT

As a result, integrating our big data sectoral proxies into nowcasting models significantly improves alignment with official GDP data

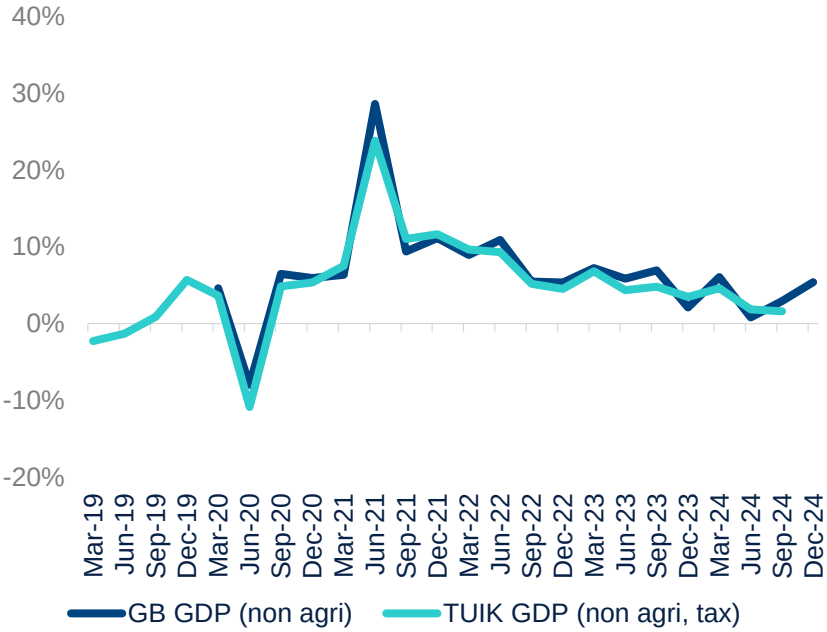
TOTAL GDP: BIG DATA INDICATOR

% YOY, REAL, NON-AGR



TOTAL GDP: MODEL BACKTEST RESULTS

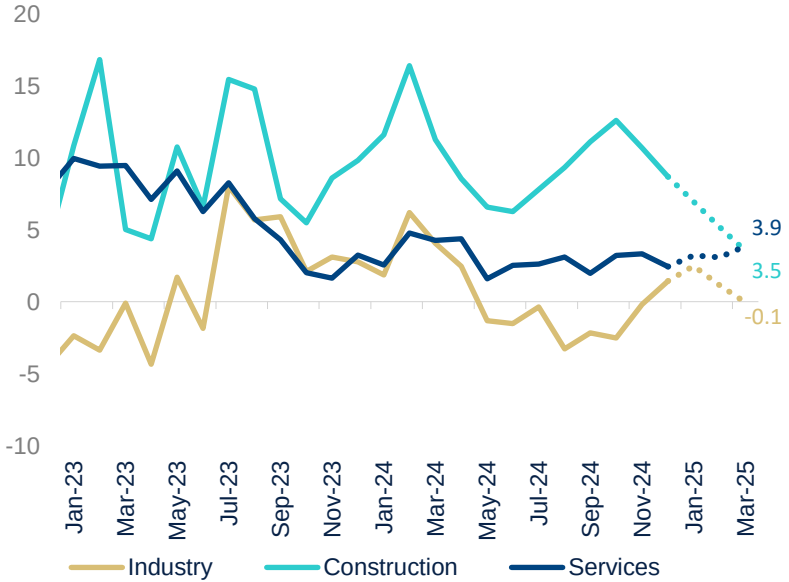
% YOY, REAL, FULL DATA



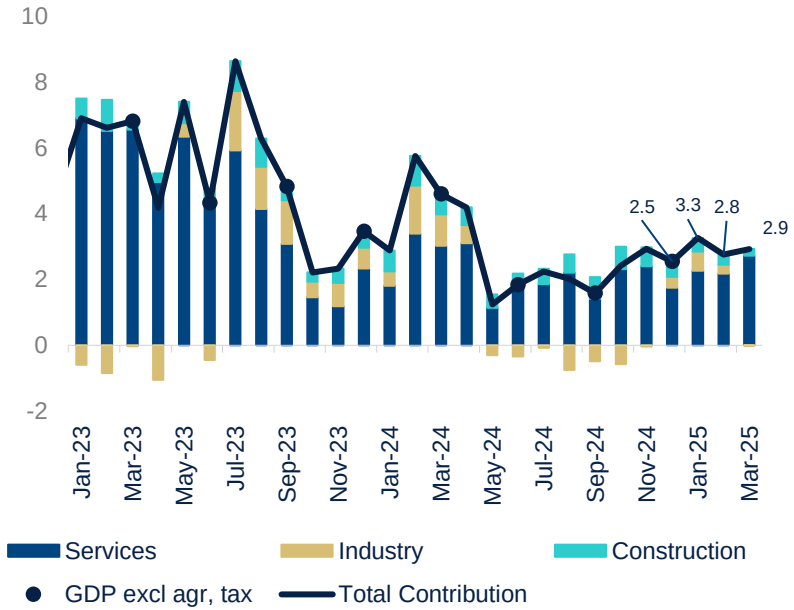
Source: BBVA Research, TURKSTAT

Overall, based on current high-frequency data, we nowcast nearly 3% y/y non-agricultural GDP growth for Q1 2025, with services being the key contributor

SECTORIAL NOWCAST RESULTS
% YOY 3MA, REAL



SECTORIAL NOWCAST RESULTS
% YOY 3MA, REAL, CONTRIBUTION



Source: BBVA Research, TURKSTAT

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BBVA Research

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April 2025

Creating Opportunities