

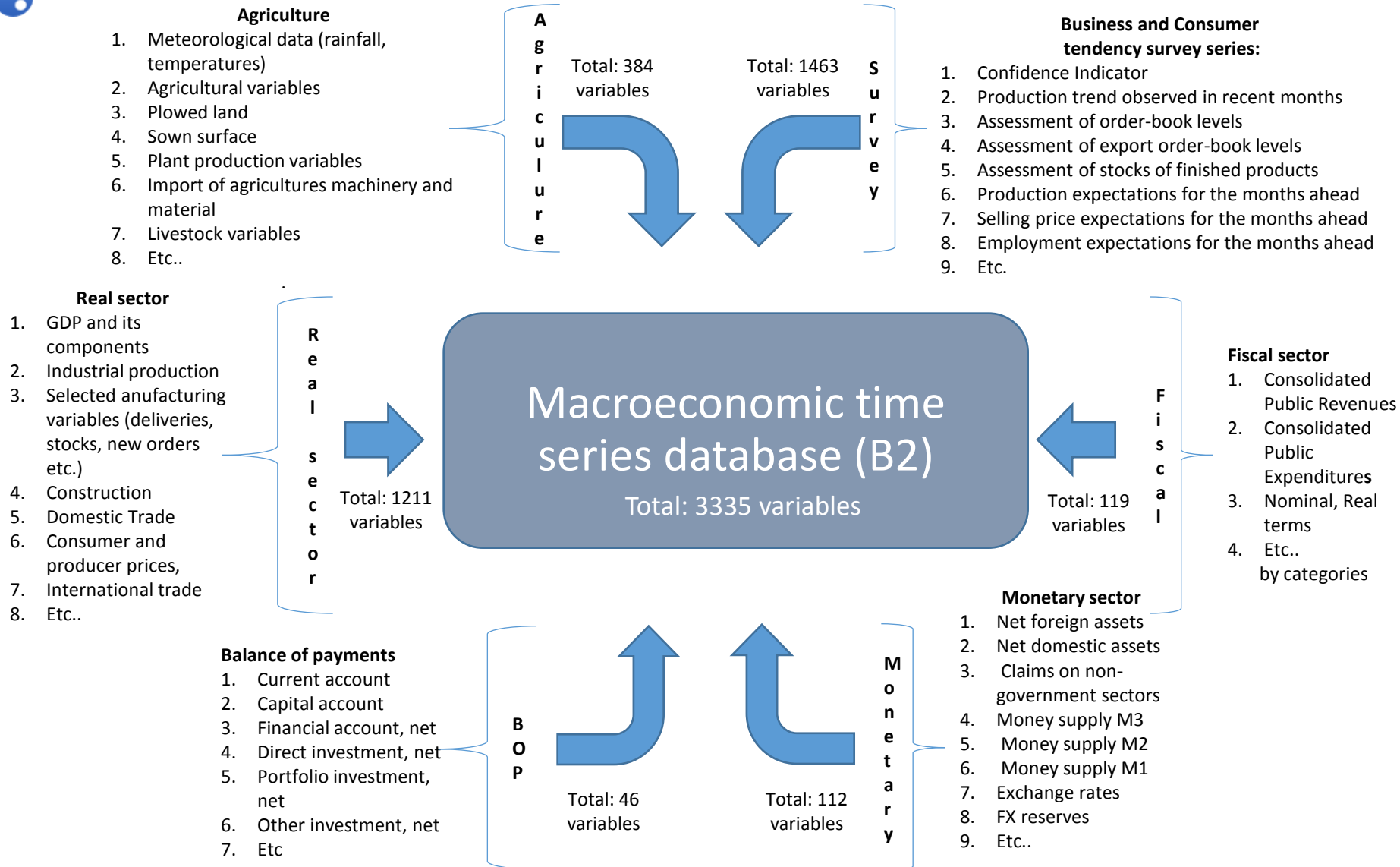
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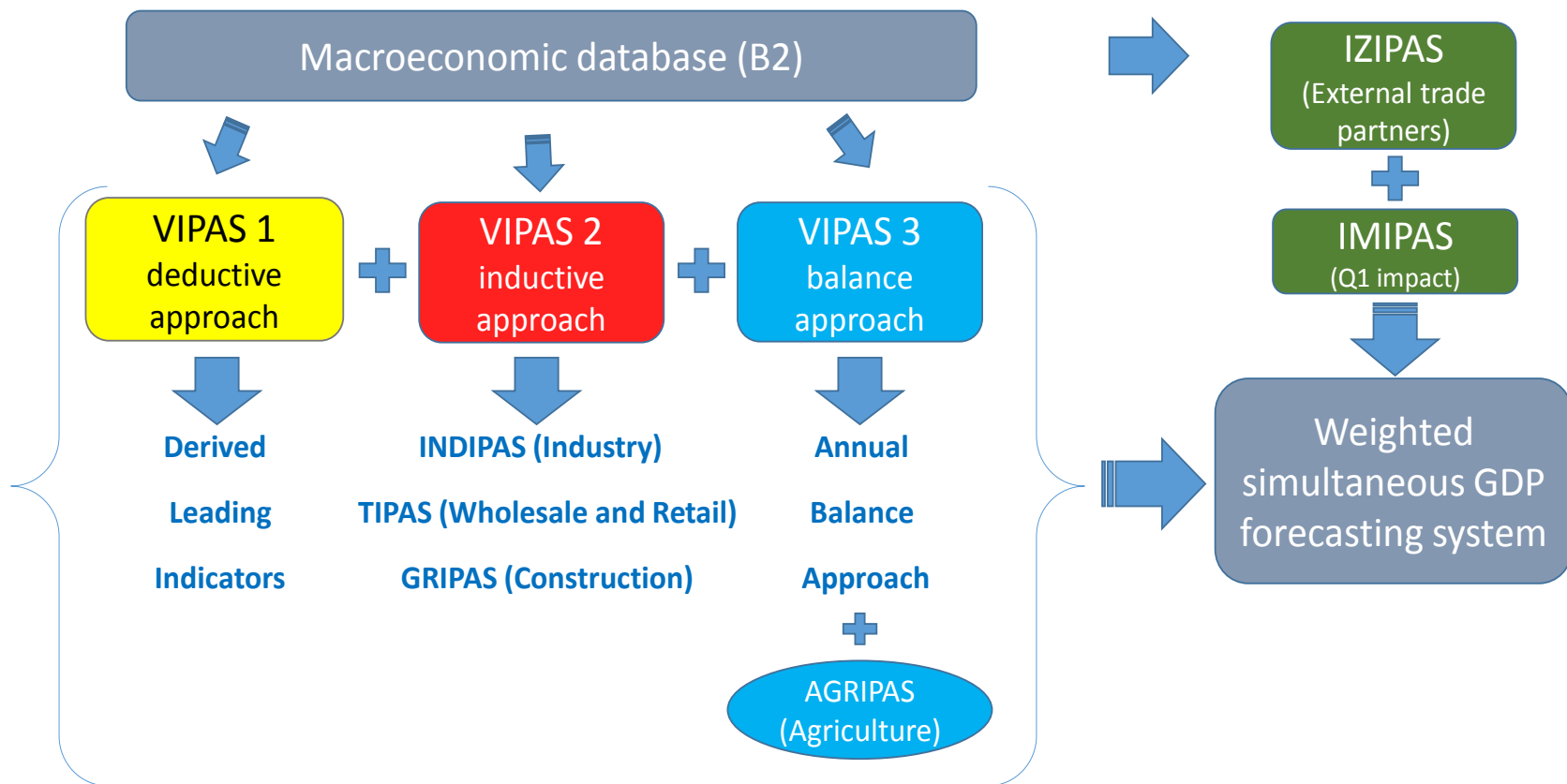
# SYSTEM OF COMPOSITE INDICATORS OF THE ECONOMIC ACTIVITY OF SERBIA (VIPAS) IN SHORT TERM FORECASTING OF GDP

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# COMPOSITE LEADING INDICATORS DATA SOURCE – VIPAS SYSTEM



# COMPOSITE LEADING INDICATORS SCHEME – VIPAS SYSTEM



# SYSTEM OF COMPOSITE LEADING INDICATORS OF SERBIAN ECONOMY – VIPAS

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- **VIPAS 1** is a composite indicator system which is main goal to anticipate economic trends in the economy of the Republic of Serbia in the short term (on average about 2 quarters in advance)
- VIPAS was constructed by selecting and aggregating individual macroeconomic indicators with the highest quality statistical properties tested:
  - ✓ Economic relevance in relation to GDP
  - ✓ Long time series and data availability on a monthly basis
  - ✓ High correlation with the cycle of GDP
  - ✓ The ability to successfully detect the turning points that have occurred in the past
  - ✓ Stable power of predicting the turning point and the cycle of business cycle over time

# METHODOLOGY OF COMPOSITE LEADING INDICATOR OF ECONOMIC ACTIVITY OF SERBIA – VIPAS 1

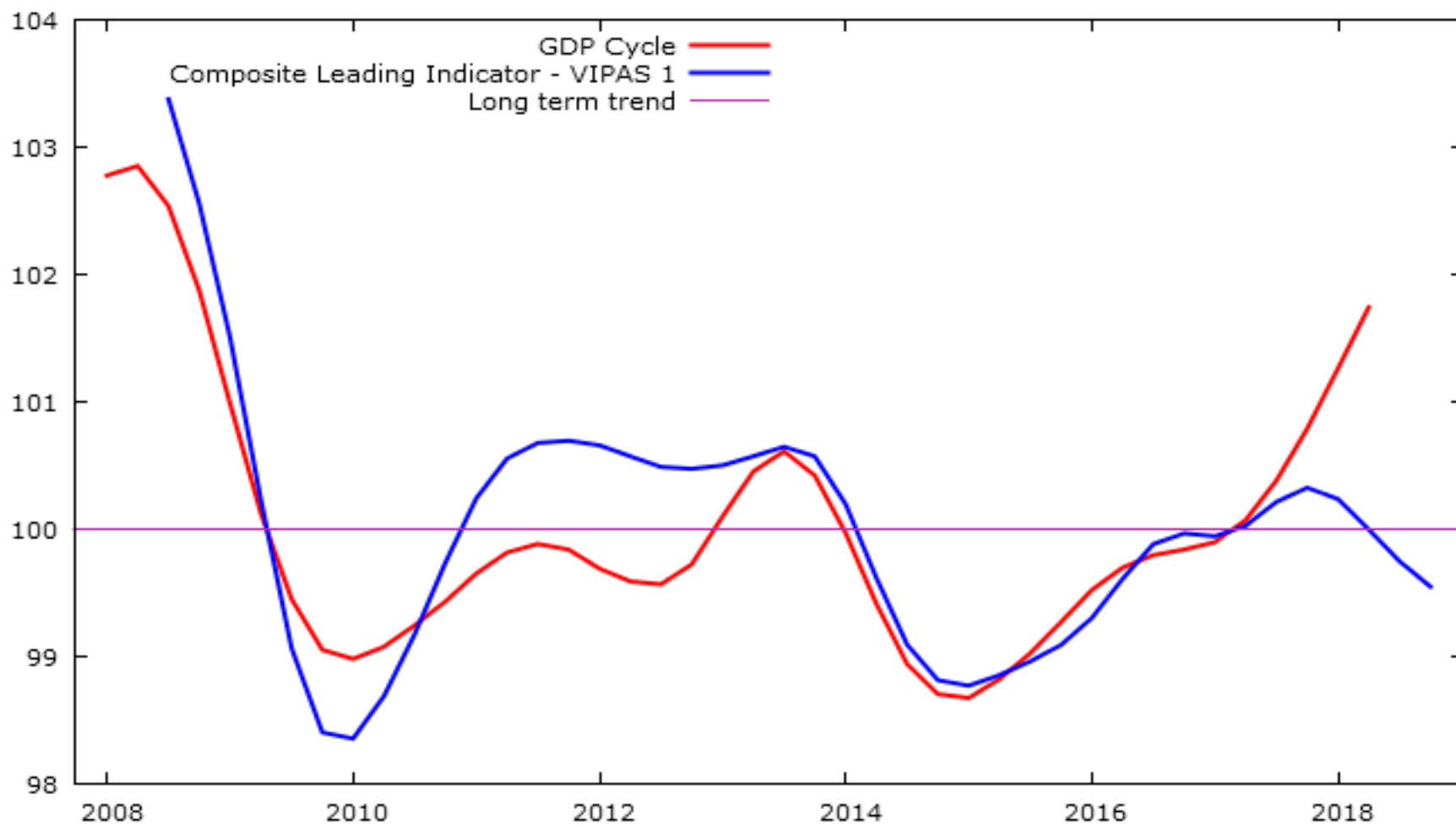
- KIPAS (a coincident indicator of Serbia's economic activity) is a composite reference indicator that establishes an indirect quarterly link between GDP and VIPAS 1
- KIPAS approximates the GDP growth on a monthly basis by aggregating three indicators: production in the sector of total industry, turnover in retail shops and number of approved building permits
- In contrast to the ability of indicators to predict the KIPAS conjuncture, their selection for VIPAS 1 is made
- After designing VIPAS 1, the econometric model of GDP forecast is produced and gives a GDP growth estimate for the current on quarterly level

**Table 1:** Forecast of GDP based on VIPAS model and achievement at the end of the year

April-Jun	2012	2013	2014	2015	2016	2017	2018
<b>VIPAS 1</b>	0.5	2.0	-1.6	0.7	2.5	2.7	3.8
<b>European Commission</b>	0.3	1.7	-	-0.1	2.0	3.2	3.3
<b>World Bank</b>	1.5	2.0	-	-0.5	1.8	2.8	3.0
<b>IMF</b>	0.5	2.0	-	-0.5	1.8	3.0	3.5
<b>Statistical office of the Republic of Serbia (end of year)</b>	-1.0	2.6	-1.8	0.8	2.8	1.9	-

Note: Forecasts of GDP, IMF (World Economic Outlook) and the European Commission (Spring Forecast) are taken from their forecasts of forecasts published in April and May each year, while the World Bank Outlook (Global Prezpects) from 2012-2017 taken over from their reports from June each year and to 2018 from the June 2018 report. Data for 2014 were not taken into account in the calculation of the coefficient of variation and comparison due to the effects of natural disasters.

# CYCLICAL ADJUSTMENTS OF LEADING INDICATOR (VIPAS 1) AND THE CYCLE OF SERBIAN GDP (q1 08 - q4 18)



# COMPONENTS OF THE VIPAS 1 INDICATOR

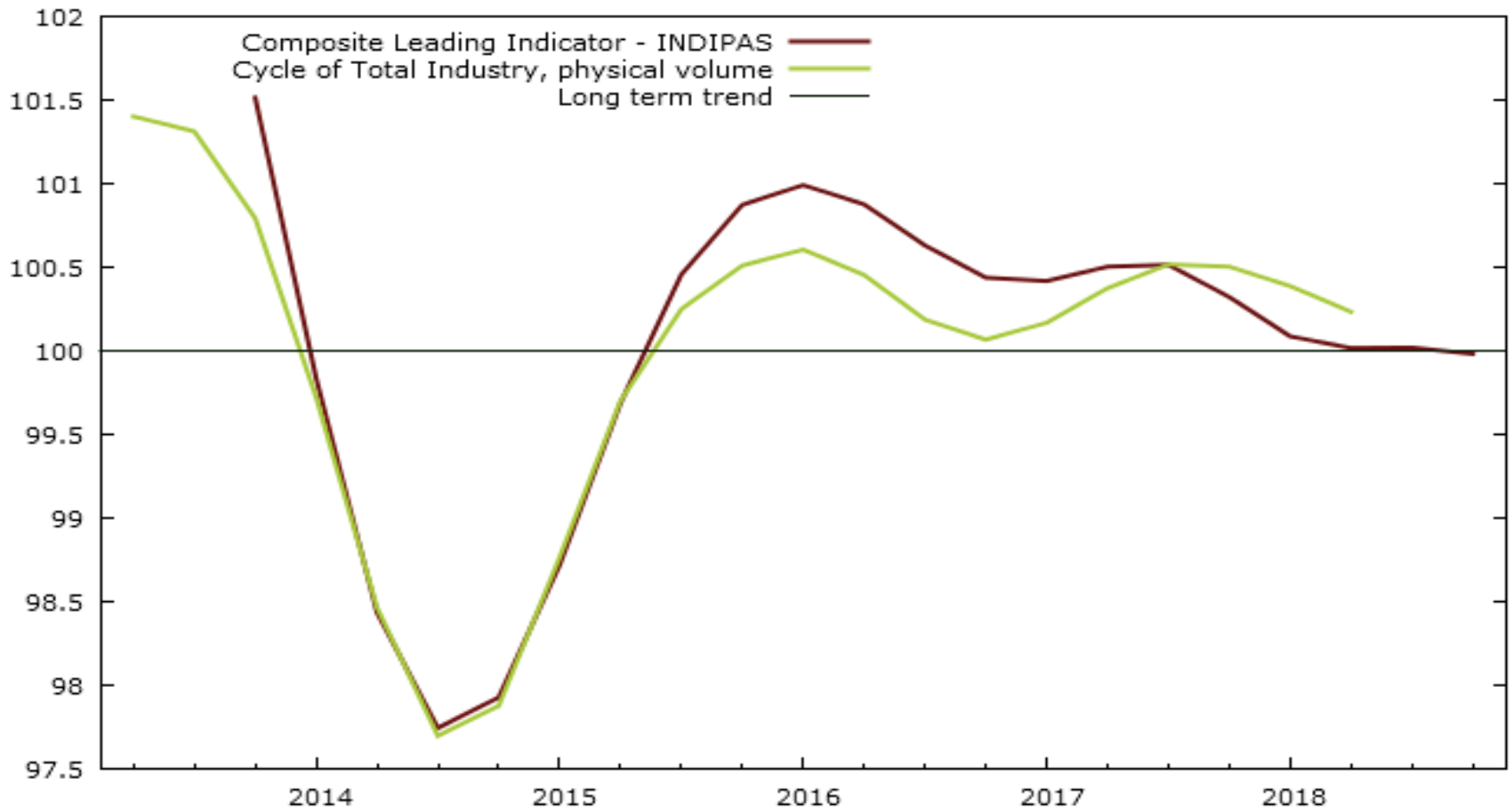
Structure of the composite leading indicator of the economic activity of Serbia-VIPAS	Start date of the time series	Number of identified points of reversal of the cycle of GDP from the maximum number	The number of missed opportunities to recognize the turning point of the cycle	Number of incorrect identifications of the turning point of the cycle	Average prediction of indicators relative to real GDP trends (in months)	Standard deviations of recognised turning points	Highest delay (in months)	Correlation with the cycle of reference indicator (proxy for monthly GDP)
Intermediate products except energy. physical volume	January 2001	8	3	0	2	3.0	5	0.73
Non-durable consumer goods. physical volume	January 2001	7	2	1	4	3.6	8	0.64
Manufacturing industry. physical volume	January 2001	8	1	2	4	3.1	5	0.80
Manufacture of chemicals and chemical products, physical volume	January 2001	9	3	2	5	5.3	4	0.70
Index of turnover in the manufacturing industry on the domestic market, physical volume	January 2008	4	1	0	3	2.6	5	0.69
Export of goods to Germany, mil. euro	January 2007	5	0	2	2	4.2	2	0.68
Export of goods to Russia, mil. euro	January 2007	5	2	1	4	2.1	4	0.56
VAT inflows, real growth	January 2008	4	1	3	9	3.6	9	0.75
Total number of arrivals of domestic and foreign tourists, thousands	January 2004	7	1	0	2	3.9	2	0.76
Index of new orders in the total industry (Assessment of order-book levels) (Survey)	May 2013	2	0	0	8	0.5	6	0.53
New orders in the intermediate goods manufacturing sector (Survey)	May 2013	2	0	0	8	1.0	5	0.60
<b>KIPAS – reference indicator</b>	<b>January 2002</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>1</b>
<b>VIPAS 1</b>	<b>January 2008</b>	<b>8</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>3.0</b>	<b>5.0</b>	<b>0.82</b>

# COMPOSITE LEADING INDUSTRIAL INDICATOR OF SERBIA - INDIPAS

- The industrial indicator of Serbia's economic activity is a leading indicator of industrial production, which, for its final goal, forecasting total industry GVA growth rate for about 2 quarters in advance. The analysis detected indicators with the best leading properties :
  - ✓ Export of electrical equipment manufacturing sector
  - ✓ Export of furniture manufacturing sector
  - ✓ Importing machinery specialized for the industry
  - ✓ Production trend observed in recent months in total Industry (*Survey*)
  - ✓ Assessment of order-book levels in total Industry (*Survey*)
  - ✓ Confidence Indicator in chemical industry (*Survey*)
  - ✓ Assessment of order-book levels in the non-durable consumer goods sector (*Survey*)
  - ✓ Dinar and dinar indexed savings and time deposits of total industry



# CYCLICAL ADJUSTMENTS OF INDUSTRIAL LEADING INDICATOR (INDIPAS) AND THE CYCLE OF TOTAL INDUSTRY PHYSICAL VOLUME (q1 13 – q4 18)

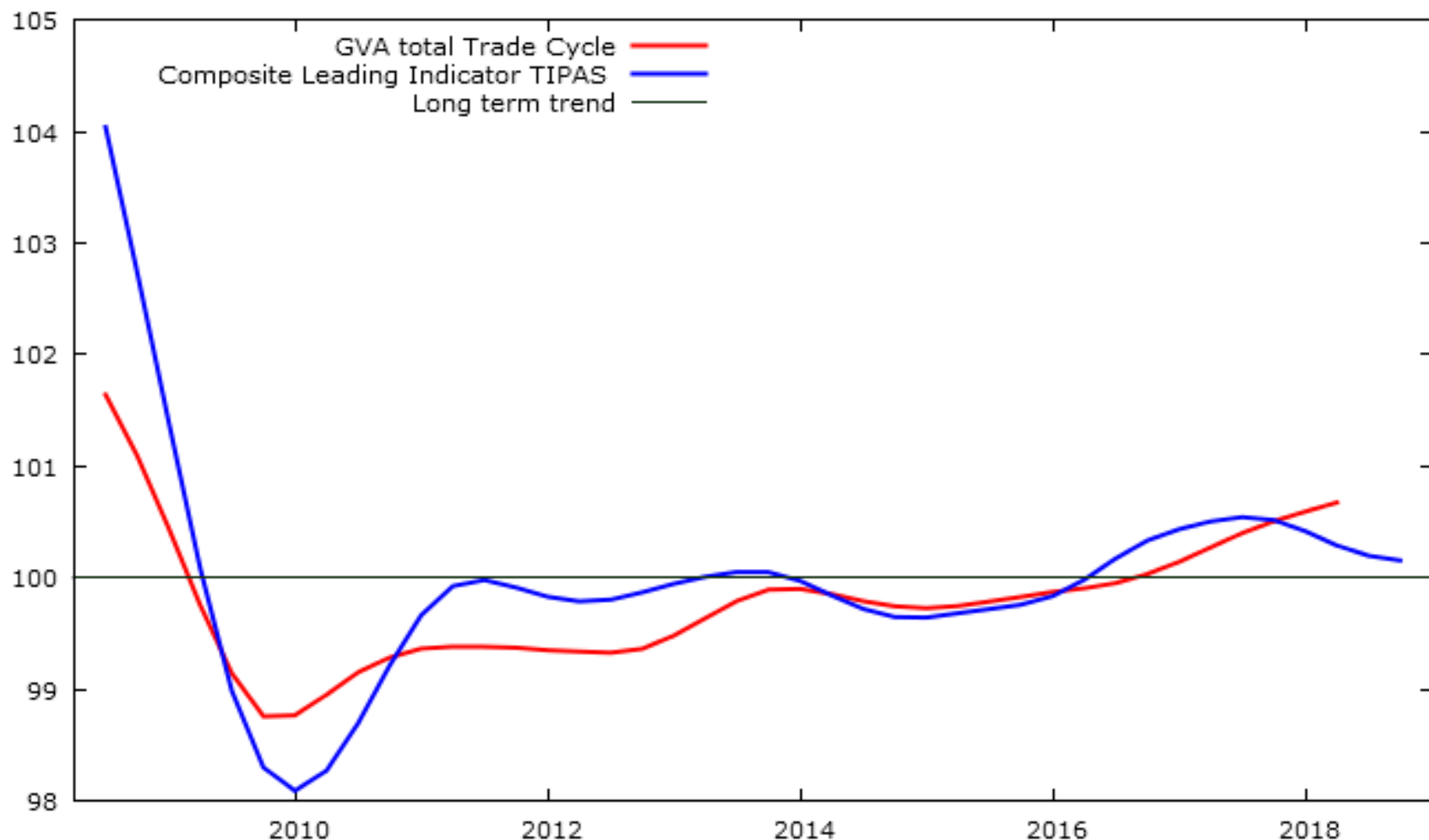


# COMPOSITE LEADING TRADE INDICATOR OF SERBIA - TIPAS



- The Trade Indicator of Economic Activity of Serbia (TIPAS) was carried out according to the following best-quality variables in the context of leading qualities versus GVA trade. As such, it is the leading composite indicator of GVA trade, which is leading in about 2 quarters. The following variables are included in its composition:
  - ✓ Manufacturing industry, physical volume
  - ✓ Turnover in the manufacturing industry, physical volume
  - ✓ Real growth of VAT inflows
  - ✓ Physical volume of retail, food, drink and tobacco at current prices
  - ✓ Total rail traffic, physical volume
  - ✓ Total freight land transport
  - ✓ Total freight river traffic

# CYCLICAL ADJUSTMENTS OF LEADING INDICATOR (TIPAS) AND THE CYCLE OF GVA TOTAL TRADE (q3 08 – q4 18)

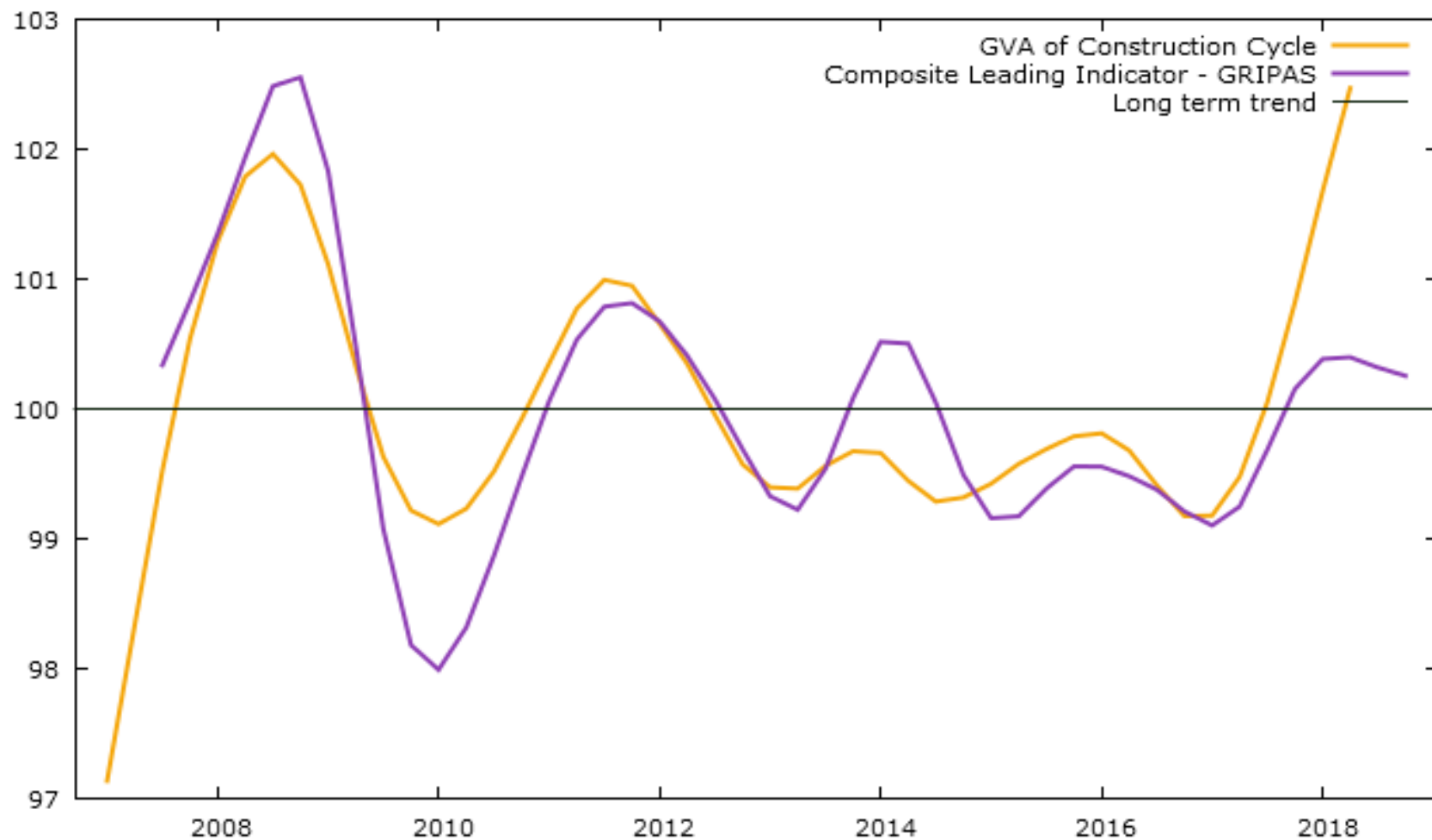


# COMPOSITE LEADING CONSTRUCTION INDICATOR OF SERBIA – GRIPAS



- The basic task of the GRIPAS indicator is the detection of cyclical trends in construction GVA and the evaluation of the annual rate for construction GVA. The analysis found that the GRIPAS indicator anticipate construction GVA cycles about 2 quarters in advance.
  - ✓ Manufacture of electrical equipment, physical volume
  - ✓ Turnover index in total industry
  - ✓ Export of metal production sector, except machinery
  - ✓ Export of goods and services in Austria
  - ✓ Export of goods and services to Slovenia
  - ✓ Transfers to other levels of government
  - ✓ Export of goods and services
  - ✓ Confidence Indicator of the repair and assembly of machinery and equipment (Survey)
  - ✓ NBS (National Bank of Serbia) Securities

# CYCLICAL ADJUSTMENTS OF LEADING INDICATOR (GRIPAS) AND THE CYCLE OF GVA CONSTRUCTION (q1 07 – q4 18)

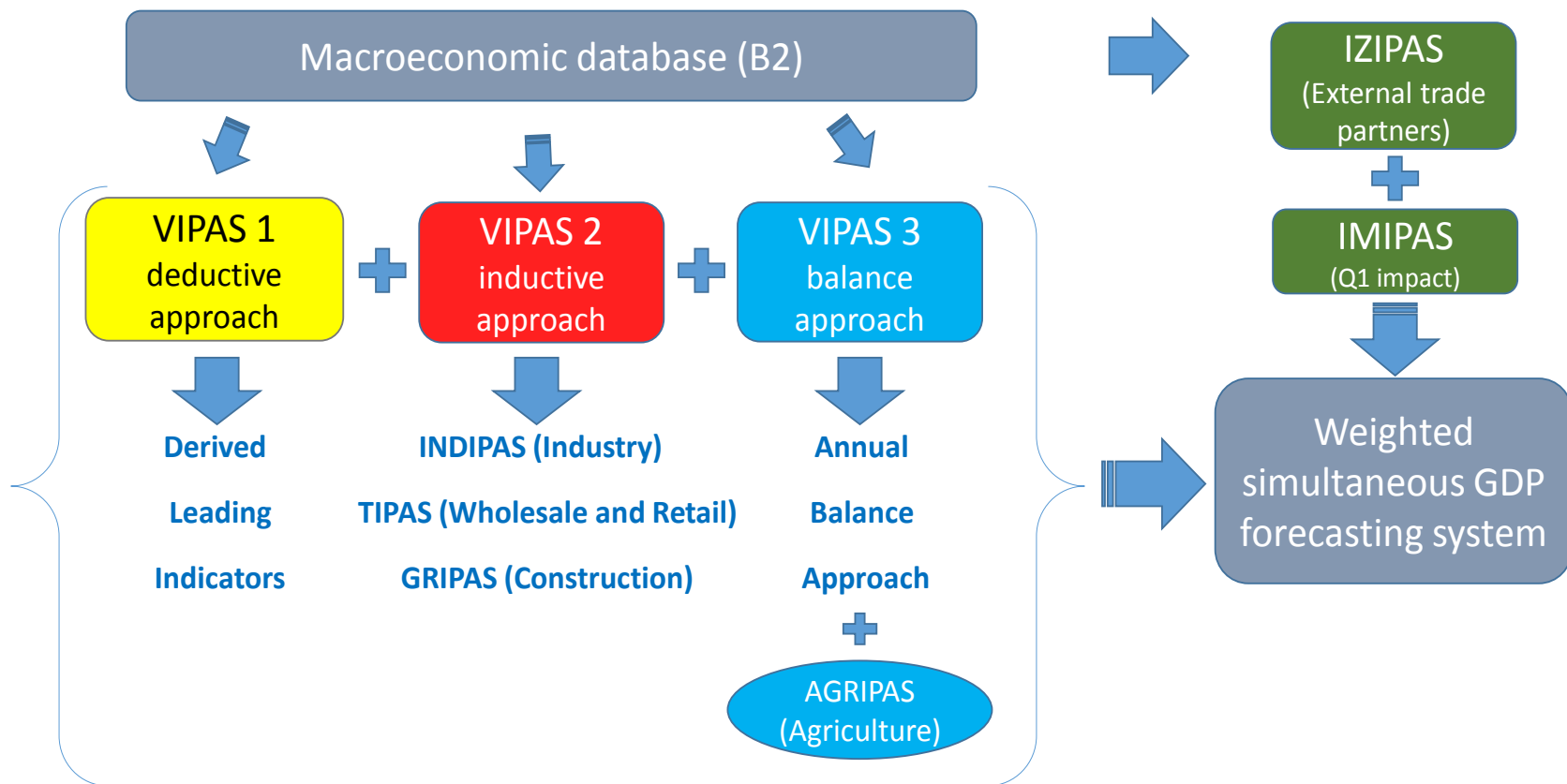


# FORECASTING OF AGRICULTURAL PRODUCTION – AGRIPAS SYSTEM

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- **The model of plant production** includes separate modeling of wheat and maize production, taking into account the precipitation factors in the period March-April and June-August, as well as the precipitation in the seedling period (October-November), the estimation of harvest areas, the variables of the dry years of wheat and corn, and more. The results of agricultural movement estimates, based on the model of plant production, will be given in May, then in early July and early September, when it is possible to finalize the final agricultural result and its quantitative impact on the GDP rate in the current year.
- **Livestock model** is based on the structural model of cattle growth and the model of primary livestock products (which is largely dependent on the results of the milk production model).
- **The result of the model** indicates that estimates that the contribution of plant production to GVA growth in agricultural production will be around 13.5 pp, while the contribution of cattle breeding production to -0.6 pp, resulting in the annual growth of GVA agricultural production in 2018 by about 12.8%. The contribution to the growth of the GDP of the agriculture sector in 2018 would thus be around 0.8 pp.

# COMPOSITE LEADING INDICATORS SCHEME – VIPAS SYSTEM



# SUPPLEMENTARY INDICATORS FOR PREDICTING SERBIA'S GDP MOVEMENT

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- **IZIPAS** - The predictive power of the previously described model has been complemented by the development of the IZIPAS indicator (the export indicator of economic activity of Serbia) constructed as a composite indicator that unites the economic dynamics of the largest foreign trade partners of Serbia and shows a high degree of agreement with the cycle of domestic economy.
- **IMIPAS** - an alternative GDP forecast model based on the creation of a structural endogenous bonding three successive cumulative quarterly econometric models of GDP, triggered by the impulse of the first quarter of each year. This method measures the elasticity of cumulative growth inertia among the quarters and designs it by the end of the year by activating all three models at the same time. This model is therefore called the impulse indicator of economic activity of Serbia (IMIPAS).



# CYCLICAL ADJUSTMENTS OF COMPOSITE INDICATOR (IZIPAS) AND THE CYCLE OF SERBIAN GDP (q1 07- q4 17)

