

## **TIGER: Tracking Indexes for the Global Economic Recovery**

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### **Technical Appendix**

#### **Methodology**

In our analysis, we employ a statistical procedure called Principal Component Analysis (PCA) that is used widely in the physical and social sciences to extract indicators that capture common fluctuations among variables in large datasets. PCA is a transparent and straightforward procedure that can easily handle a large number of variables and enables one to construct indicators of comovement across all variables in a dataset or a subset of them. This procedure is ideal for creating the TIGER indexes as it allows us to combine information from different types of economic variables and multiple countries.

Each variable that enters into the PCA is a priori given an equal weight in the calculations. The procedure then assigns different weights to different variables depending on how important they turn out to be in capturing fluctuations in the entire set of variables. PCA is a special case of a more general technique called factor analysis that captures more complicated patterns of lead and lag correlations across the variables—it is important to note that PCA picks up only contemporaneous correlations.

#### **Dataset**

Our dataset covers most of the G-20 countries and contains a set of key real, financial and confidence variables. The main constraint in expanding our dataset to cover more variables is the lack of consistent data availability at a high frequency, especially among the emerging markets. For example, it is difficult to get good data on employment levels for the emerging markets. Nevertheless, we have assembled a set of variables on which we were able to get reasonably timely and high-quality data. The countries and variables in our dataset are listed below. Note that composite total indexes include only Advanced Economies and Emerging Market Economies groups.

#### **Advanced Economies**

- Australia
- Canada
- France
- Germany
- Italy
- Japan
- Korea
- Netherlands
- Spain
- United Kingdom
- United States

#### **Emerging Market Economies**

- Argentina
- Brazil
- China
- India
- Indonesia
- Mexico
- Russia
- South Africa
- Turkey

#### **Euro Periphery**

- Greece
- Italy (Advanced)
- Ireland
- Portugal
- Spain (Advanced)

#### **Economic Indicators**

##### *Real Activity Indicators*

- Capacity Utilization
- Employment
- Exports
- Industrial Prodn.
- Imports
- GDP
- Manufacturing Orders
- Retail Sales
- Unemployment Rate

##### *Financial Indicators*

- Equity Market Index
- Stock Market Capitalization
- Credit Growth
- Emerging Market Bond Spreads
- TED Spread
- VIX

##### *Confidence Indicators*

- Business Confidence
- Consumer Confidence

**By Country:**

Overall Growth Index – Business Confidence, Consumer Confidence, Capacity Utilization, Employment, Exports, Imports, Industrial Production, GDP Growth, Manufacturing Orders, Retail Sales, Unemployment Rate, Equity Markets, Credit Growth, Ted Spread<sup>1</sup>, VIX

Real Activity Index – Capacity Utilization, Employment, Exports, Imports, Industrial Production, GDP Growth, Manufacturing Orders, Retail Sales, Unemployment Rate

Financial Index – Equity Markets, Market Capitalization, Credit Growth, Emerging Bond Spreads, TED Spread, VIX

Confidence Index – Business Confidence, Consumer Confidence

**By Indicator Variable:**

Advanced Economies, Emerging Market Economies, and Total Indexes are found by aggregating directly across country data. We create composite indexes separately for the groups of advanced economies and emerging markets covering all of the above variables. We also create additional indexes for each of these groups based on each category of variables listed below (real, financial, confidence). Finally, we generate country-specific indicators that cover all the variables for a given country and also variable-specific indicators that cover all countries' data for a given variable.

**Description of Data and Source Information:**

Indicator Variable	Unit	Description	Source
Business Confidence	Index	National confidence indicator	OECD
Consumer Confidence	Index	National confidence indicator	OECD
Capacity Utilization	Percent	Capacity utilization rate for industrial sector	Haver Analytics; National sources
Employment	Percent	12-month growth rate of total employment levels	IMF International Financial Statistics; National sources
Exports	Percent	12-month growth rate of 3 month moving average. Seasonally Adjusted, Volume, USD	World Bank, Global Economic Monitor
Imports	Percent	12-month growth rate of 3 month moving average. Seasonally Adjusted, Volume, USD	World Bank, Global Economic Monitor
Industrial Production	Percent	12-month growth rate of 3 month moving average. Seasonally Adjusted Volumes	World Bank, Global Economic Monitor; National sources
GDP Growth	Percent	Quarterly, year-over-year real growth rate. Each month in quarter are equal to quarterly rate	IHS Global
Manufacturing Orders	Percent	12-month growth rate of new manufacturing orders. Seasonally adjusted, local currency or index.	Haver Analytics; National sources
Retail Sales	Percent	12-month growth rate of 3 month moving average. Seasonally adjusted, Volume, Index	World Bank, Global Economic Monitor; National sources
Equity Markets	Percent	12-month growth rate of share price index in national currency	Yahoo Finance; IMF International Financial Statistics
Stock Market Capitalization	Percent	12-month growth rate in national currency	CEIC Data Company, Ltd.

<sup>1</sup> The TED Spread, by construction, is available only as a single variable and is not country-specific.

Credit Growth	Percent	12-month growth rate in national currency. Banking claims on private sector	IMF International Financial Statistics; Federal Reserve; Bank of Japan
Emerging Bond Spreads	Level	Basis points over US treasury	World Bank, Global Economic Monitor
TED Spread	Level	Difference between 3-month LIBOR and U.S. Treasury, basis Points	US Department of Treasury; Federal Reserve (FRED)
Unemployment Rate	Percent	Percent of labor force as defined by country	Official statistics
VIX	Level	Volatility index for national stock markets	Bloomberg

## Data Composition of TIGER Indexes

The matrix below shows which countries and variables are included across the aggregated TIGER indexes.

	Bus Conf.	Cons. Conf.	Cap. Utilization	Employment	Export	Import	Ind. Prodn	GDP	Man. Orders	Retail Sales	Equity Market	Market Cap	Credit Growth	Emerging Bond Spreads	Unemployment Rate	VIX
<b>Advanced:</b>																
Australia	x	x	x	x	x	x	x	x	-	-	x	x	x	-	x	-
Canada	-	x	x	x	x	x	x	x	x	x	x	-	-	-	x	-
France	x	x	x	x	x	x	x	x	-	x	x	x	x	-	x	-
Germany	x	x	x	x	x	x	x	x	x	x	x	x	x	-	x	-
Italy	x	x	x	x	x	x	x	x	x	x	-	x	x	-	x	-
Japan	x	x	x	x	x	x	x	x	x	x	x	x	x	-	x	-
Korea	x	x	-	x	x	x	x	x	-	x	x	x	x	-	x	-
Netherlands	x	x	x	x	x	x	x	x	-	x	x	x	x	-	x	-
Spain	x	x	x	x	x	x	x	x	x	x	x	x	x	-	x	-
UK	x	x	-	x	x	x	x	x	-	x	x	x	x	-	x	-
US	x	x	x	x	x	x	x	x	x	x	x	x	x	-	x	-
<b>Emerging Markets:</b>																
Argentina	-	-	-	x	x	x	x	x	-	-	x	x	x	-	-	-
Brazil	x	x	-	x	x	x	x	x	-	x	x	x	x	-	-	-
China	x	x	-	x	x	x	x	x	-	x	x	x	x	-	-	-
India	-	-	-	-	x	x	x	x	-	-	x	x	x	-	-	-
Indonesia	-	-	-	-	x	x	x	x	-	x	x	x	x	-	-	-
Mexico	x	x	-	x	x	x	x	x	-	x	x	x	x	-	-	-
Russia	x	-	-	-	x	x	x	x	-	-	x	x	x	-	-	-
South Africa	x	x	-	x	x	x	x	x	-	x	x	x	x	-	-	-
Turkey	x	x	-	x	x	x	x	x	-	x	x	x	x	-	-	-

## Data Availability

The table below describes the availability of each variable by country. All data are monthly and begin on January 2005 and end in the specified month of 2016.

	Bus Conf.	Cons. Conf.	Cap. Utilization	Employ ment	Export	Import	Ind. Prodn	GDP	Man. Order	Retail Sales	Equity Market	Market Cap	Credit Growth	Emerging Bond Spreads	Unem ploym ent Rate	VIX
<b>Advanced:</b>																
Australia	Nov '15	Feb	Dec '15	Feb	Jan	Jan	Dec '15	Q4 '15	-	-	Mar	Feb	Jan	-	Feb	Aug '15
Canada	-	Jan	Dec '15	Feb	Jan	Jan	Dec '15	Q4 '15	Jan	Jan	Mar	-	-	-	Feb	Aug '15
France	Feb	Feb	Dec '15	Dec '15	Jan	Jan	Jan	Q4 '15	-	Dec '15	Mar	Jan	Jan	-	Dec '15	Aug '15
Germany	Feb	Feb	Dec '15	Jan	Jan	Jan	Jan	Q4 '15	Jan	Jan	Mar	Feb	Jan	-	Feb	Aug '15
Italy	Feb	Feb	Dec '15	Dec '15	Jan	Jan	Jan	Q4 '15	Dec '15	Jan	Mar	Feb	Jan	-	Jan	-
Japan	Dec '15	Jan	Jan	Jan	Feb	Feb	Jan	Q4 '15	Jan	Jan	Mar	Feb	Feb	-	Jan	Aug '15
Korea	Feb	Feb	-	Feb	Feb	Feb	Jan	Q4 '15	-	Jan	Mar	Feb	Dec '15	-	Jan	Aug '15
Netherlands	Feb	Feb	Dec '15	Dec '15	Jan	Jan	Jan	Q4 '15	-	Jan	Mar	Feb	Jan	-	Feb	-
Spain	Feb	Feb	Jan	Dec '15	Jan	Jan	Jan	Q4 '15	Jan	Jan	Mar	Feb	Jan	-	Dec '15	-
UK	Feb	Feb	-	Dec '15	Jan	Jan	Jan	Q4 '15	-	Feb	Mar	Feb	Jan	-	Jun	Aug '15
US	Feb	Feb	Feb	Feb	Jan	Jan	Feb	Q4 '15	Jan	Jan	Mar	Feb	Feb	-	Feb	Aug '15
<b>Emerging Markets:</b>																
Argentina	-	-	-	Jun '15	Feb	Feb	Oct '15	Q4 '15	-	-	Mar	Feb	Jan	May '14	-	-
Brazil	Feb	Feb	-	Feb	Feb	Feb	Jan	Q4 '15	-	Jan	Mar	Feb	Dec '15	May '14	-	-
China	Feb	Dec '15	-	Dec '15	Feb	Feb	Feb	Q4 '15	-	Feb	Mar	Feb	Jan	May '14	-	-
India	Aug '15	-	-	-	Feb	Feb	Jan	Q4 '15	-	-	Mar	Feb	Nov '15	-	-	-
Indonesia	Dec '15	-	-	-	Feb	Feb	Jan	Q4 '15	-	Feb	Mar	Feb	Jan	-	-	-
Mexico	Jan	Jan	-	Sep '15	Jan	Jan	Jan	Q4 '15	-	Jan	Mar	Jan	Jan	May '14	-	-
Russia	Feb	-	-	-	Jan	Jan	Feb	Q4 '15	-	-	Mar	Feb	Jan	May '14	-	-
South Africa	Dec '15	Dec '15	-	Dec '15	Jan	Jan	Jan	Q4 '15	-	Jan	Mar	Feb	Dec '15	May '14	-	-
Turkey	Feb	Feb	-	Dec '15	Jan	Feb	Jan	Q4 '15	-	Jan	Mar	Feb	Jan	May '14	-	-

Note: TED Spread data, not country specific, ranges from January 2005 through March 2016.

### Data Availability for Euro Periphery

The table below describes the availability of each variable for Greece, Ireland, and Portugal. Availability for Italy and Spain are included in the above Advanced Economy group. All data are monthly and begin on January 2005 and end in the specified month of 2016.

	Bus Conf.	Cons. Conf.	Cap. Utilization	Employment	Export	Import	Ind. Prodn	GDP	Man. Order	Retail Sales	Equity Market	Market Cap	Credit Growth	Emerging Bond Spreads	Unemployment Rate	VIX
Greece	Feb	Feb	-	-	Jan	Jan	Dec '15	Q4 '15	-	Dec '15	Mar	Feb	Jan	-	Dec '15	-
Ireland	-	Jan	-	-	Jan	Jan	Jan	Q4 '15	-	Jan	Mar	Feb	Jan	-	Feb	-
Portugal	Feb	Feb	-	-	Jan	Jan	Jan	Q4 '15	-	Jan	Mar	Dec '15	Jan	-	Jan	-

### Data Composition of Euro Periphery Country Indexes

The matrix below shows which countries and variables are included in the country indexes for Greece, Ireland, and Portugal. Italy and Spain are included in the above Advanced Economy group.

	Bus Conf.	Cons. Conf.	Cap. Utilization	Employment	Export	Import	Ind. Prodn	GDP	Man. Orders	Retail Sales	Equity Market	Market Cap	Credit Growth	Emerging Bond Spreads	Unemployment Rate	VIX
Greece	x	x	-	-	x	x	x	x	-	x	x	x	x	-	x	-
Ireland	-	x	-	-	x	x	x	x	-	x	x	x	x	-	x	-
Portugal	x	x	-	-	x	x	x	x	-	x	x	x	x	-	x	-