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Introducing the PwC Global Consumer Index (GCI)

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pwc

Executive Summary

Consumer spending is critical to the world recovery. It is the biggest component of the global economy and so a key driver of future growth.

It can be hard to get a sense of the consumer cycle. There is a constant stream of information, across an array of countries, which purports to give some indication. But it can be impossible to discern the key facts amongst the noise. To help make sense of this, PwC has compiled key leading indicators[1] of consumer spending into a single global index – the PwC Global Consumer Index (GCI). The index is timely and forward-looking, providing a useful indication of future consumer demand for goods and services and an early steer on short-term growth prospects.

What the index is telling us

The latest version of the GCI is for October 2012. We present the results in two ways:

***Growth:** this is the current year-on-year growth rate of the GCI. The historic average of this measure since 1995 is 2.7%.*

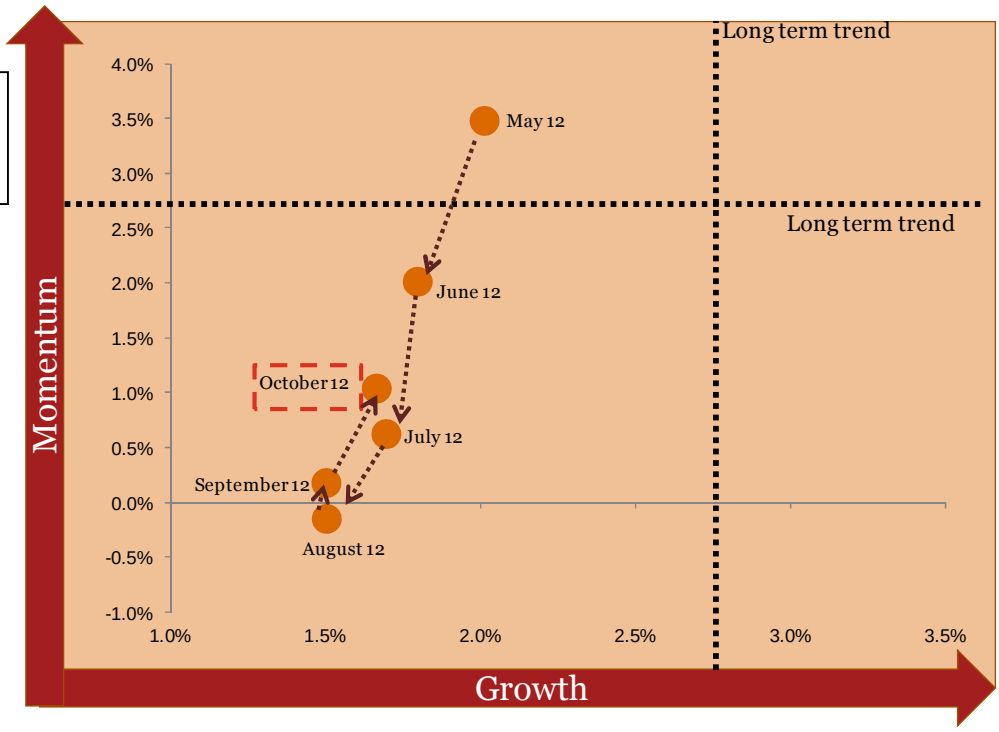
***Momentum:** Year-on-year growth gives a picture of the last twelve months. This measure focuses on the last three months only, giving an annualised growth rate for the period (i.e. what would the annual growth be if the index grew at the rate of the last three months for a whole year?).*

Figure 1 presents the October growth and momentum values for the GCI along with the previous five monthly readings for comparison. The dotted lines denote the long term trend readings.

*The results from the index deteriorated over the summer, but the latest numbers have ticked up slightly. The **Growth** of the index stands at 1.7% in October, from 1.5% September.*

***Momentum** tells a similar story. Following four consecutive and sharp monthly falls, it dipped into negative territory in August (the first time it has done so since the end of the financial crisis). It has since risen first to 0.2% in September and then to 1.0% in October. So the index is currently predicting growth well below trend, but not a double dip global downturn.*

Figure 1 Latest PwC Global Consumer Index (GCI) trends



[1] As detailed in the appendix, the component indicators include equity indices, business and consumer confidence, the Baltic dry shipping index, industrial production and money supply growth.

Introduction

Consumer spending is critical to the world economy. It is the largest component of global GDP with consumers in the 20 largest economies spending a combined US$ 27 trillion in 2011.

Prior to the 2008 recession, consumer spending offered strong support to global growth. People in most developed economies saved relatively little given a benign economic backdrop and used credit to increase their spending. In emerging markets the fast growing middle classes also spent freely.

In the 'New Normal' post-2008 economy, consumers in richer countries have cut back significantly. Credit is less easy to get and fear of unemployment and debt means people are choosing to save more of their income than before. Despite continued relatively robust growth in the large emerging markets, the bounce back in global consumer spending has been weak.

There are a myriad of indicators in each country that may give insight into the consumer cycle, such as business and consumer confidence surveys, commodity prices, equity indices and other financial market data. Trying to get a sense of the big picture from this barrage of information can be challenging. To try to make sense of it all we have compiled and reviewed hundreds of these indicators, condensed them to get a global picture and analysed how well they match the consumer spending cycle.

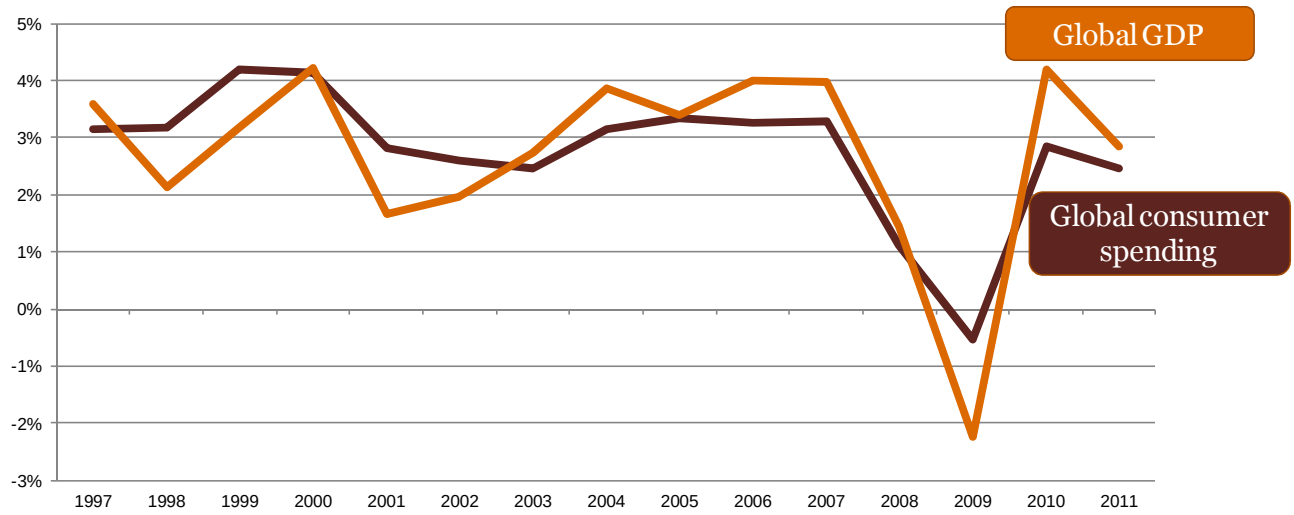
The result of this process is the construction of the PwC Global Consumer Index (GCI) – a tool which may give businesses and policy makers an early steer on the latest trends.

Global consumer spending

The starting point in developing the GCI was to estimate the value of consumer spending globally. Limitations on the availability, quality and timeliness of data meant that it was not feasible to get an up-to-date aggregate of spending in every country in the world.

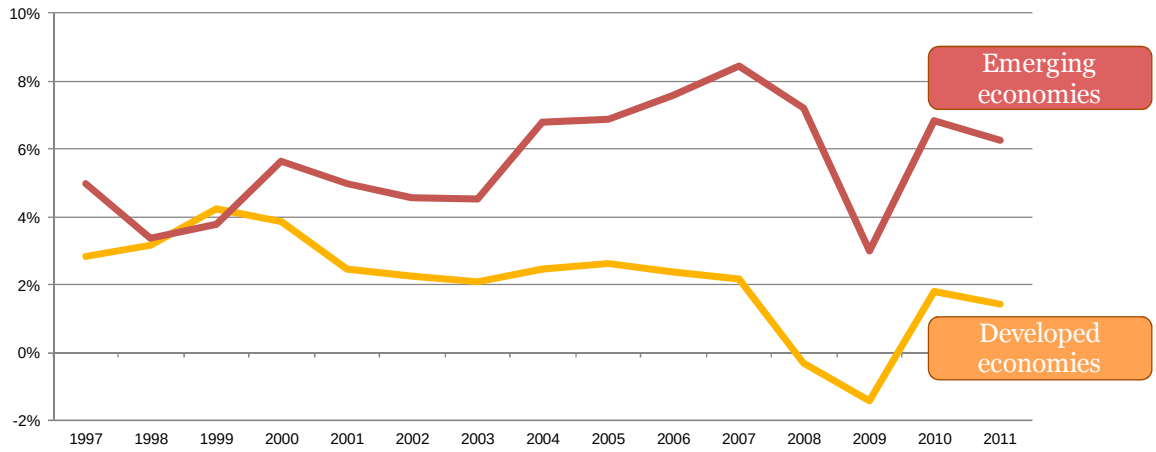
We have instead focussed on 20 of the World's largest economies which together represent more than 80% of global GDP. The result of this analysis since 1997 is illustrated in Figure 2 below, which shows annual growth in global consumer spending against IMF figures for annual real growth in global GDP (on a market exchange rate basis).

Figure 2 Global growth in consumer spending and GDP



Source: GDP data sourced from the IMF; Consumer spending data are PwC estimates using data from National Statistical Agencies, UN and IMF

Figure 3 Growth in consumer spending



Source: PwC estimates using data from National Statistical Agencies, UN, and IMF

The data cover a number of cycles in the World economy:

- 2000-2002 – the limited global economic slowdown after the dot-com bubble burst
- 2003-2007 – strong expansion supported by rapid growth in emerging markets
- 2008-2011 – the global recession following the credit crunch, and subsequent economic recovery

In comparing the two lines in Figure 2 it is noticeable that the consumer spending cycle was less severe than the GDP cycle during the recent global recession. Consumer spending accounts for more than half of global GDP; but other components in GDP, such as business investment and inventories can be more cyclical.

The other notable trend in the consumer spending data was the divergence in growth between emerging economies and developed economies since 2000[2]. This is vividly depicted in Figure 3. Spending growth in emerging economies has averaged 5.7% per annum since 1997, almost three times the relatively pedestrian rate of 2.1% achieved in developed markets.

Developing the GCI

The development of the indicator began by setting out the principles we felt it should follow. In particular we considered that the indicator should be:

1. **Frequent and timely** – consumer spending data tends to be issued on a quarterly basis, and the time taken to compile statistics means that figures are typically published one to two months after the quarter is over. We wanted a measure which could be presented on a monthly basis and give an indication of the current trends.

2. **Forward looking** – we wanted to identify indicators which tended to lead the consumer spending cycle, which would produce an index with some predictive properties for consumer spending patterns over the next few months.

3. **Transparent** – It can be tempting to opt for a 'black box' statistical approach that appears to fit the historic data well but may be hard to explain in a clear and credible way. However, we wanted to have a transparent and simple measure which could be easily understood.

With these principles in mind we undertook an extensive process to compile, analyse and combine a number of economic indicators. The process is described in greater detail in the methodological appendix.

[2] The emerging economies in our sample are Brazil, China, India, Indonesia, Mexico, Poland, Russia and Turkey. The developed economies are Australia, Canada, France, Germany, Italy, Japan, Netherlands, South Korea, Switzerland, the UK and the US.

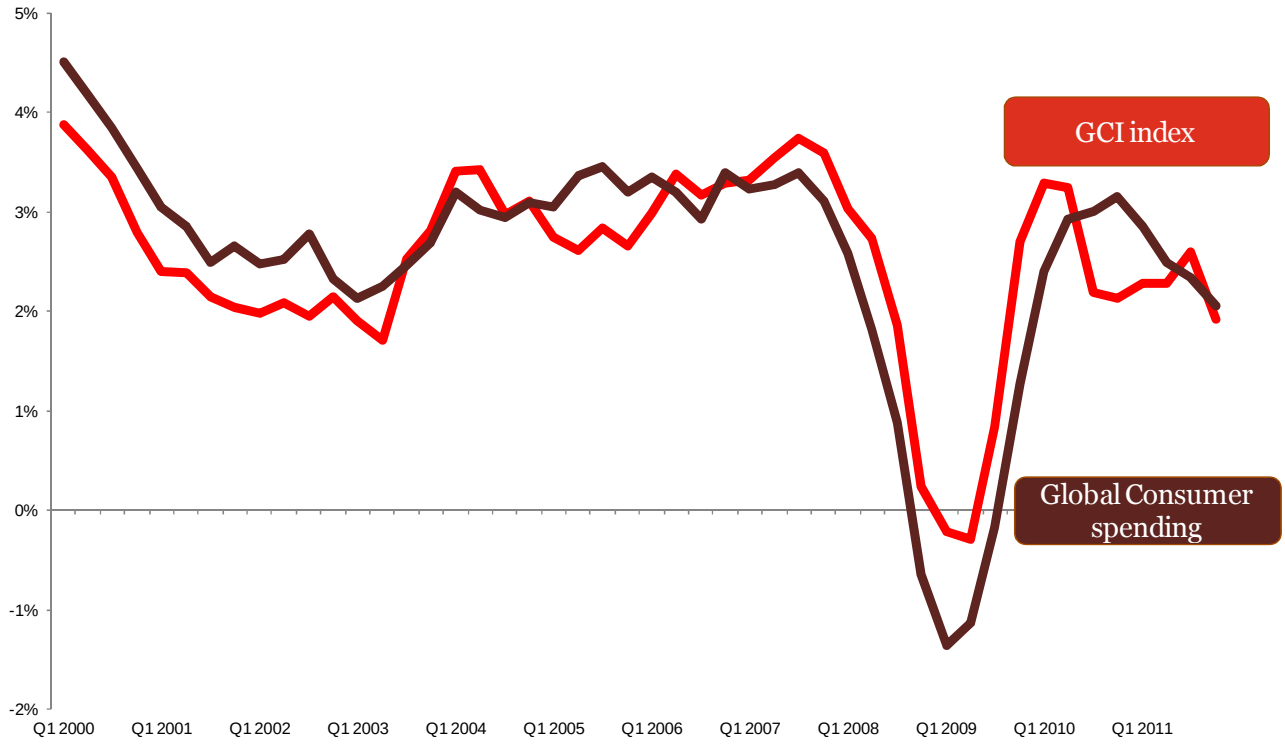
The result was an index constructed by combining a range of data including equity market indices, confidence measures, and activity indicators. These are listed in Table 1.

The Global Consumer Indicator which was constructed from all of these indicators is shown in Figure 4 below, along with the global consumer spending estimates for comparison.

Table 1 Indicators included in GCI

Category	Indicators
Equity markets	S&P global index, and global sector indices for companies in the following sectors: automotive, capital goods, construction, consumer goods, finance, heavy industry, real estate, retail and consumer services.
Confidence indicators	Global consumer confidence, Global business confidence
Commodity indicators	Baltic Dry index, Overall commodity prices, Energy prices
Activity measures	OECD money supply, Global industrial production

Figure 4 GCI index and Global consumer spending, year-on-year growth



Source: PwC analysis

The trends since 2000 show that the indicator has tracked the key movements in consumer spending well, with an overall correlation of 82% since 2000[3]. The availability of the GCI on a monthly basis (with the index being available two weeks after the end of the month) means that it gives a far more timely steer on the direction of consumer spending than official statistics that may not be available on a global level for several months as national accounts data tends to be quarterly (or even only annual in some countries) and produced with a lag of one to two months after the end of each quarter. The box presents some more detailed analysis showing the value of the GCI in giving an earlier indication of global consumer trends than national accounts data.

[3] Refers to the simple correlation of year-on-year growth rates.

How has the indicator performed?

To be useful as a leading indicator the GCI needs to provide a timely indication of trends in consumer spending. To get an idea of its performance we can examine how it evolved during a major economic cycle, the recent financial crisis. Figure 5 presents the growth in the GCI index on a monthly basis since 2007, highlighting key phases of the cycle. Table 2 compares the GCI against Global Consumer Spending and OECD GDP. On a quarterly basis the GCI has moved in-line with these measures. The GCI's leading properties come from its monthly availability and because it is available during the month in question. In contrast, economic data is only available quarterly, and typically two months after the quarter has ended.

Figure 5 GCI index, year-on-year growth

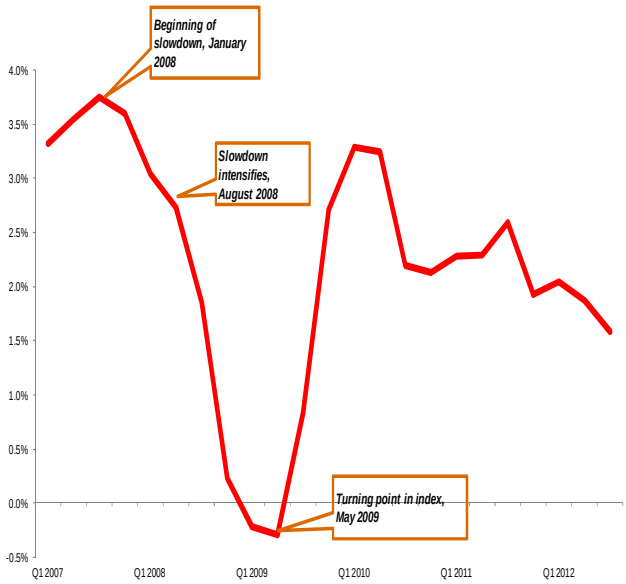


Table 2 Selected economic data (2007-2009)

Period	Growth QoQ% (YoY%)		
	GCI	Global consumer spending	OECD GDP
Q3 2007	0.8% (3.7%)	0.7% (3.3%)	0.6% (3.0%)
Q4 2007	0.7% (3.6%)	0.8% (3.4%)	0.6 % (2.7%)
Q1 2008	0.4% (3.0%)	0.3% (3.1%)	0.2% (2.3%)
Q2 2008	0.8% (2.7%)	0.1% (2.6%)	-0.2% (1.3%)
Q3 2008	0.0% (1.9%)	-0.3% (1.8%)	-0.7% (0.0%)
Q4 2008	-0.9% (0.2%)	-0.8% (0.8%)	-2.2% (-2.9%)
Q1 2009	0.0% (-0.2%)	-0.5% (-0.7%)	-2.3% (-5.3%)
Q2 2009	0.7% (-0.3%)	0.2% (-1.5%)	-0.2% (-4.9%)
Q3 2009	1.1% (0.8%)	0.7% (-1.4%)	0.6% (-3.6%)
Q4 2009	0.9% (2.7%)	0.6% (-0.4%)	0.9% (-0.5%)

Downturn (2008)

Year-on-year growth in the GCI began to decline in the January 2008 reading (data for which would have been available in late January). This decline started very gradually, as Q2 numbers remained strong. The GCI really "fell off a cliff" from August 2008 onwards. On this basis, someone using the CGI to follow trends at the time may have been alerted to a potential slowdown around the end of Q1 2008, but would not have anticipated a recession until the August figures at least.

To compare the GCI to economic data of the time, Table 2 presents the measurements coming from the GCI with consumer spending estimates and GDP in the OECD countries (a group of around 30 developed economies). The latter is used because global GDP data is not available on a quarterly basis. These data show the official economic figures remained strong in 2007 and then slowed in Q1 2008, the data for which became available around May 2008. By this time, year-on-year growth in the GCI had been on a downward trajectory for five months, so giving an indication of the slowdown in advance.

The August reading of the GCI would have confirmed that the slowdown was to be sharp. In this instance a similar conclusion would have been drawn from the OECD GDP data – which showed contraction for Q2 in the August/September release. However the consumer spending numbers did not turn negative until the following quarter.

Turning point (2009)

In early 2009 the global economy began to turn around – and there is a clear turning point in the GCI. The year-on-year growth in the index bottomed out in April 2009, before quickly recovering and moving into positive territory in July 2009 after three consecutive months of growth.

Economic data for this period shows that the GLI correctly signalled a return to positive quarterly growth in Q2 2009 – significantly in advance of when the corresponding national accounts data became available around September 2009.

What is the GCI telling us now?

The latest economic data shows that consumer spending has contracted in a number of major European economies in 2012. However, spending has continued to grow in the US and most other economies outside Europe. According to our consumer spending estimate, although growth has eased from the levels seen in 2010 and 2011, it remains comfortably positive at the global level.

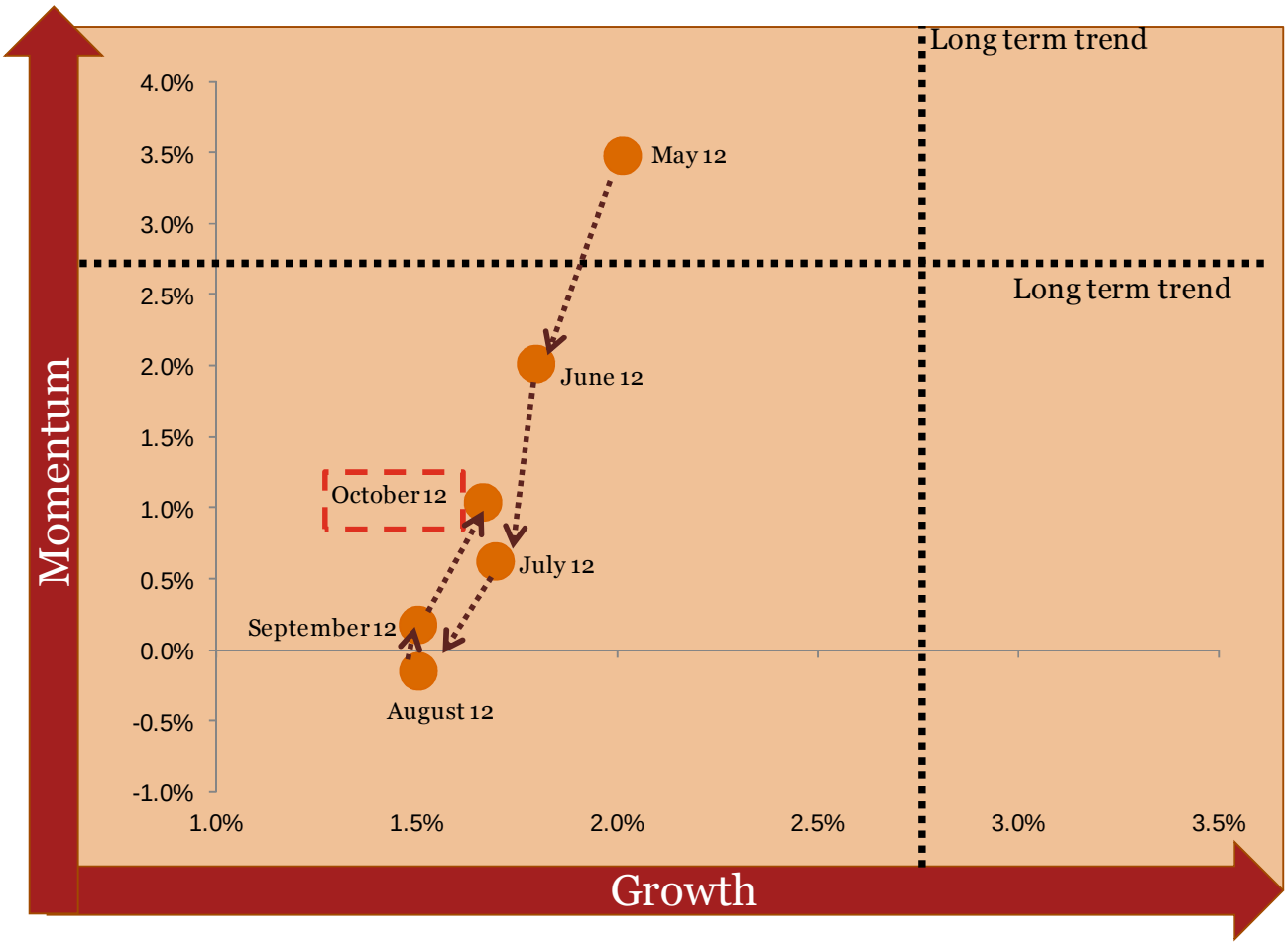
However, the GCI suggests that the global economic recovery has been losing steam. Growth in the index has decelerated fairly consistently since the recent high of 2.1% in May.

The latest available version of the GCI is for October 2012 (The index was designed to use lagged variables to ensure it is more timely, so the October index uses September data). The results are shown in Figure 6 below; we present them in two ways:

Growth: this is the current year-on-year growth rate of the index. The historic average of this measure since 1995 is 2.7% per annum.

Momentum: this measure focuses on the last three months only, giving an annualised growth rate for the period (i.e. what would the annual growth be if the index grew at the rate of the last three months for a whole year).

Figure 6 Latest results of the GCI



Source: PwC analysis

Figure 6 presents the October 2012 growth and momentum values for the GCI, along with the previous five monthly readings for comparison. The dotted lines denote the long term average readings for both growth and momentum.

The results from the index deteriorated over the summer, but the latest numbers have ticked up slightly. The **Growth** of the index stands at 1.7% in October, from 1.5% September.

Momentum tells a similar story. Following four consecutive and sharp monthly falls, it dipped into negative territory in August (the first time it has done so since the end of the financial crisis). It has since risen first to 0.2% in September and then to 1.0% in October. So the index is currently predicting

growth well below trend, but not a double dip global downturn.

The full list of growth figures for each of the components of the index are presented in Table 3 below.

Table 3 Latest data used in the GCI index

Indicator (period)	Growth YoY%
S&P global 1200 (Sep)	17.5%
Global Auto index (Sep)	11.8%
Global capital goods index (Sep)	16.5%
Global construction index (Sep)	-2.7%
Global consumer goods index (Sep)	22.4%
Global financials index (Sep)	19.9%
Global industrials index (Sep)	15.9%
Global real estate index (Sep)	22.8%
Global retail index (Sep)	27.4%
Global consumer services index (Sep)	17.3%
Baltic Dry Index (Sep)	-61.0%
Commodity prices (Aug)	-1.1%
Energy prices (Aug)	4.4%
Consumer confidence (Sep)	-2.9%
Business confidence (Sep)	-0.6%
Industrial production (Aug)	-1.5%
Money supply (Aug)	5.3%
GCI (October)	1.7%

Source: PwC analysis

The recent up-tick in the trajectory of the index has been driven by a broad based improvement in the components. In particular, the equity price measures have performed well. The commodity market measures, such as the Baltic Dry Index and consumer confidence have performed less strongly.

The GCI will be updated every month to show the latest trends and the results will be published in the PwC Global Economy Watch.

Methodological Appendix

Figure 7 Overview of methodology

Country selection	Consumer spending	Leading indicator selection	Analysis	Index construction
• Top 20 countries accounting for 80% of global GDP	• Country-level data aggregated to generate a global consumer spending estimate • Adjustments applied to ensure cross-country comparability • **X-12 ARIMA** method used to adjust non-seasonally adjusted data	• Indicators selected on the basis of practical considerations and relevance • **Standard adjustments** applied to ensure comparability • **Cross-country data aggregation**	• **Cross-correlation analysis** • **Normalisation** • **Econometric analysis**	• The Index is a weighted average of leading indicators

Figure 7 provides an overview of our methodology in constructing the PwC Global Consumer Index (GCI). Below we outline each stage of this methodology in more detail.

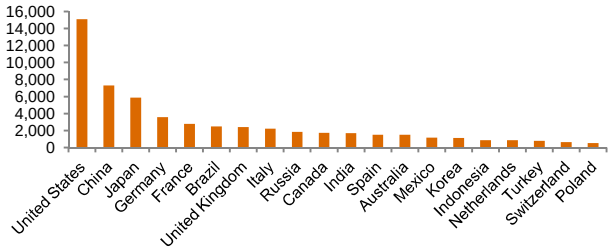
Country selection

The first stage of our methodology involved the selection of countries to be included within the analysis. Recognising the difficulty in obtaining data on consumer spending for every country in the world on a reliable basis, we selected major economies that account for the largest shares of global GDP to ensure that the constructed Index is as global representative as possible.

On these criteria, the G7 are included, as well as leading emerging economies such as the BRIC nations, Indonesia, Mexico and Turkey.

The 20 constituent countries are shown in Figure 8 below. These account for approximately 80% of global GDP on a current market exchange rate basis.

Figure 8 GDP of countries included in the analysis



Consumer spending

Though actual consumer spending data does not ultimately feed into the index, it was instrumental in guiding its construction. The second step in our process, after selecting the countries, was to construct our global consumer spending estimates.

The original data for consumer spending were provided on a quarterly basis, sourced predominantly from national statistical offices of the respective countries. The data were in constant prices and were largely denominated local currency units (LCU). Where the data were annualised (sums over four quarters) we applied a simple linear interpolation to generate quarterly data. Seasonally adjusted data was used where available.

The country-level quarterly real consumer spending data was first deflated using individual country GDP deflators, and where these were not available consumer price indices were used instead. This process rebased all data to the same year (2010).

The figures were then converted into US dollars (USD) using a 10-year average of local currency to USD exchange rates (2000-2010). The average exchange rate was used to avoid the unnecessary introduction of volatility in the quarterly growth rates due to short term exchange rate fluctuations. The constituent consumer spending figures could then be added up to derive a single "global" series, denominated in US dollars.

The Chinese data posed a particular challenge as they were not available at a quarterly level on a consistent basis. For this we have taken annual household consumption expenditure data provided by the UN and applied a constant quarterly growth rate to generate a quarterly series. This did result in a smoothed series for China; but in the absence of official quarterly data this was the best available approach.

Leading indicator selection

The Index is constructed from economic series that display similar fluctuations to those in consumer spending and, critically, precede them. The key principles which directed our selection of data to test for the index were:[4]

Practical considerations

1. **Timeliness**: indicators must be made available as early as possible after each period.
2. **Frequency**: data must be available on a monthly basis to allow for regular reporting of the indicator.
3. **Reliability**: data was sourced only from reliable international or national sources.
4. **History**: data with a long historical series was preferred to ensure there were sufficient data points to analyse past performance.

Relevance

5. **Leading relationship**: the indicators must have predictive properties and lead consumer spending.
6. **Rationale**: The indicators must also have an economic rationale for the above relationship.
7. **Coverage of indicators**: The indicators should have a wide coverage of different types of economic activity

Table 4 provides a list of indicators shortlisted for inclusion within the Index and the rationale for inclusion.

Seasonal adjustments

We preferred seasonally adjusted indicators, but in some cases these were not available. In these cases the **X-12 ARIMA** seasonal adjustment model was used[5]. As well as for some of the leading indicators, seasonal adjustments were also applied to the consumer spending series for Brazil, India, Indonesia and Turkey.

Aggregation

The analysis we undertook compared global consumer spending to global leading indicators. In some cases the selected indicators were already global in scope (e.g. global equity market measures). Other indicators were only available nationally, and in these cases we applied an aggregation process.

To do this we made several standard adjustments (depending on the type of variable) to ensure that cross-country data were additive and comparable.

In a number of cases it was necessary to weight measures for different countries to account for their different contributions to the global total. For example, the global consumer and business confidence indices were generated using a market exchange rate GDP-weighted average of individual country indices.

IMF and WTO merchandise export data, which were in current US Dollars, were converted into real values using the US GDP deflator and aggregated to generate a value for global merchandise exports.

Individual country series for car sales and registrations were aggregated to generate a global value for car sales.

In addition, we shortlisted the "Recession" index which was created with the help of the web tool Google Trends, which provides a volume index of web searches corresponding to the search term "Recession" relative to the total number of searches done on Google over time.

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[4] Our approach is consistent with the OECD's methodology in constructing its Composite Leading Indicators. *OECD System of Composite Leading Indicators (CLI), April 2012*

[5] Developed by the US Census Bureau, the method is commonly used method to seasonally-adjust data by international organisations such as the IMF and World Bank, as well as the ONS and other leading national statistical institutes.

Table 4: Shortlisted indicators

Indicator	*Coverage*[6]	*Rationale for inclusion in shortlist*	*Data source*
Exports	Top 20	Rising exports may be indicative of improving prospects for spending and economic growth.	IMF, WTO
Equity market indices	Global	Changes in equity prices can reflect confidence amongst retail investors, and also have a direct effect on household balance sheets.	Thomson Reuters
Sector equity indices (various)	Global	Certain sector equity indices may be more sensitive to anticipated changes in consumer spending, e.g. key consumer sectors such as consumer durables.	Thomson Reuters
Commodity prices	Global	Commodity prices reflect economic activity. The earlier in the production cycle it is used, the more likely it is to lead activity.	IMF
Baltic Dry Index	Global	The Baltic Dry Index tracks trends in global supply and demand as by monitoring the cost to transport raw materials such as metals, grains and fossil fuels by sea.	Baltic Exchange
Consumer confidence	Top 20[7]	Confidence reflects consumer expectations of the economic outlook, indicating future increases in spending or tightening.	OECD, EC
Business confidence[8]	Top 20[9]	Businesses must constantly anticipate consumer demand to ensure have the right capacity.	OECD, national sources
Interbank lending rates[10]	Top 20	Lending rates have an ambiguous effect: high interest rates squeeze spending but may be in response to an increase in inflation from rapid growth in consumer spending.	BBA, OECD, Thomson Reuters, national sources
Passenger car sales/registrations	Top 20[11]	An increase in purchases of big ticket items such as passenger vehicles may reflect an improvement in consumer sentiment, signalling the possibility of higher consumer spending.	OECD
Industrial production	Top 20	Increases in production levels may reflect anticipated upticks in consumer spending as businesses increase production to meet expectations of future demand.	OECD, national sources
"Recession" Index	Global	As the economic outlook worsens, there will be an increase in the volume of web searches which include "recession".	Google Trends
Housing starts	United States	Housing purchases are forward-looking and are a reasonable barometer of consumer expectations of the economic outlook.	US Census Bureau
M3 Money supply	OECD	The M3 measure of broad money is an effective bellwether for the strength of lending and credit markets. Emerging market data were not included due to the need for timely data.	OECD

[6] "Top 20" coverage is limited to the set of the 20 constituent countries of the Index; "Global" coverage is defined as coverage of all countries, i.e. not limited to the "Top 20"; See *Selection of constituent countries* within this document for more detail.

[7] Russia and India excluded due to insufficient historical data

[8] Manufacturing business confidence has been used

[9] Canada, India and Indonesia excluded due to lack of recent data

[10] 3-month interbank rates have been used, where unavailable this was replaced with the overnight rate

[11] Brazil, China and Russia excluded due to insufficient historical data

Analysis

The next stage of the process analysed the potential leading indicators against the global consumer spending measure to guide inclusion in the final index.

Normalisation

Even after the adjustment processes described above, the component series were still expressed in different units or scales. To overcome this, growth rates for the candidate leading indicators were taken and then normalised using the z-score method[12].

Cross-correlation analysis

We initially conducted a cross-correlation analysis using normalised growth rates of various leads and lags of candidate series with consumer spending. This provided an indication of the strength of cyclical conformity of candidate series to consumer spending.

A strong correlation between consumer spending and lagged values of the candidate indicators may indicate that the latter provides a signal of future developments in consumer spending.

Econometric analysis

A simple multivariate time series econometric model was developed using lagged values of the candidate leading indicators. The model was developed using a stepwise approach[13]. A model with strong fit[14] was identified; however, high levels of co-linearity between the explanatory variables meant that few could be included in the final specification (based on the required statistical confidence). Also in some cases, variables had an unexpected sign.

As a result, the econometric analysis was used as a guide to the variables to include in the index, but the coefficients were not used directly.

Index construction

The Index was constructed as a weighted average of normalised growth rates of the leading indicators and their respective lags

Findings from the correlation and econometric analysis informed the final selection of indicators and weights used in the Index. In addition, further testing was undertaken to refine the weights by applying constrained maximisation equations, which were designed to maximise the correlation of the index with consumer spending, whilst maintaining balance and coverage in the final weighting.

The final list of indicators used in the index is shown, along with their weightings, in Table 5 below.

Table 5 Final index selection

Indicators	Weight
Equity market indices (S&P global 1200, Global Auto, Global capital goods, Global construction, Global consumer goods, Global financials, Global industrials, Global real estate, Global retail, Global consumer services)	30%
Baltic Dry index	5%
Commodity price indices (All commodities, Energy)	15%
Global Consumer confidence	15%
Global Business confidence	5%
Global Industrial production	10%
Global Money supply	20%

[12] Growth rates were expressed in terms of the number of standard deviations away from the mean growth rate.

[13] The process of including all indicators initially and then removing the least significant variables one at a time, until only variables that have the required level of statistical significance remain.

[14] Measured by the sum of squared errors

PwC Macro Consulting

Economic Views reports are produced by PwC's Macro Consulting team. The team maintains in-house models of over 40 economies which together account for 90% of global GDP. This provides us with the essential understanding of the economic outlook around the world. To this we add systematic and in-depth exploration and analysis of prevailing and emerging trends – economic and otherwise.

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