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Klaus Abberger
Wolfgang Nierhaus

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Construction of Composite Business Cycle Indicators in a Sparse Data Environment

Abstract

Business cycle indicators are important instruments for monitoring economic development. When employing indicators one usually relies on a sound statistical database. This paper deals with indicator development in a sparse data situation. Indicator building is merged with temporal disaggregation, which is often used by statistical offices. The discussed tools are applied in a case study for Abu Dhabi. Because the economy of Abu Dhabi is very dependent on oil, real income reflects the economic situation better than real gross domestic product (GDP). For this reason a measure of real gross domestic income (GDI) was chosen as reference series.

JEL-Code: E010, E320, C220.

Keywords: business cycle indicators, temporal disaggregation, terms of trade, oil-producing countries.

Klaus Abberger
Ifo Institute for Economic Research at the University of Munich
Poschingerstrasse 5
Germany – 81679 Munich
Abberger@ifo.de

Wolfgang Nierhaus
Ifo Institute for Economic Research at the University of Munich
Poschingerstrasse 5
Germany – 81679 Munich
Nierhaus@ifo.de

1. Introduction

Business cycles are fluctuations in the capacity of the entire economic production potential. These cycles are referred to as *growth cycles* to distinguish them from the (*classical*) business cycle with absolute contractions. Each cycle comprises an expansion and a contraction phase with the phases being connected by lower and upper turning points. If the trend of the real gross domestic product (GDP) is interpreted as a non-structural estimate of production potential, then the growth cycle can be measured on the basis of the deviation of GDP to its trend. The turning points are defined as the maximum distance of GDP from its trend value. Growth cycles might be approximated by cycles in the growth rate of real GDP.

Business cycle indicators should be able to describe cyclical economic development in a timely and accurate fashion. They are divided according to their temporal relationship to the cycle in leading, coincident and lagging indicators. For the analysis of the present economic situation coincident indicators are of particular importance. A composite indicator combines several individual indicators to summarize the economic condition – as shown by a reference series – in a single statistic.

The construction and use of business indicators has a long history in economics. Systematic considerations that date back to the 1930s were carried out by a group of economists around Arthur Burns and Wesley Mitchell of the National Bureau of Economic Research (NBER).[1] At the time various methodological leaps hade been made. Especially the econometric tools were improved dramatically. Static and dynamic factor models were employed. Nonlinear techniques like hidden Markov models and multivariate techniques have been developed.[2] These sophisticated methods require a sound data base, however. Some of these methods are even developed to draw on huge data sets, like the factor approach of Stock and Watson.

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1 See Mitchell and Burns (1938).

2 See Hamilton (1989) and especially for nonparametric methods Fan and Yao (2005).

This paper deals with the development of business cycle indicators in a sparse data environment, where even a high frequency reference series is missing. Although many countries have already built up statistical reporting systems and agencies of high quality, there are still some countries where this process is ongoing and the data availability is still not sufficient for the highly sophisticated econometric methods. Even so these countries are keen to present timely business cycle indicators, perhaps as part of an information toolkit for investors so that countries are more attractive to international capital or for local actors to monitor risks for the economy.

One such country where a statistical reporting system is still in development is Abu Dhabi. As a case study, a coincident indicator for Abu Dhabi is constructed in this article. For this country a further complication arises. It is a resource rich country, relaying heavily on oil. So a business cycle concept based on capacity utilization and production could be misleading. Cycles in income, or real income, is a more suitable benchmark for economic conditions.

The paper is structured as follows. The next chapter presents the recipe and the tools used for the construction of composite indicators in the case of a sparse data environment. The applied statistical methods are well established. The innovation of this paper is that sensible procedures for the underlying data situation are chosen and that these methods are combined in a specific new way. The procedure is then applied to the data situation in Abu Dhabi.

2. Construction Procedure

In the following a general procedure for developing business cycle indicators in a sparse data environment is discussed. The data situation is characterized by only a few possible indicators and by the lack of a high frequency reference series. Business cycle indicators should be calculated at least at a quarterly time scale. Usually gross domestic product (GDP) is used as reference. In the absence of GDP, synthetic activity measures or indicators of key parts of the economy (e.g. industrial production) could be considered. The reference series should be:

- reliable
- contain a broad/important range of economic activity
- be in a quarterly or monthly frequency.

Countries that are building up statistical offices usually start with statistics on an annual basis. Annual data are not suitable for a timely monitoring the business cycle development, however. Nevertheless, these data can be used as an anchor for the assessment of high frequency indicators.

The composite indicator construction algorithm consists of the following steps. First, possible indicators have to be searched for and their characteristics have to be collected. Then, a first classification of the candidates must be made. A more sound assessment of indicators requires a comparison with a reference series. Therefore available information has to be used to construct such a reference. Some of the indicators may be useful for this task. Then, the final selection of single indicators can be done and the composite indicator can be weighted as a whole.

In this procedure only well-established statistical methods are used. These methods are not explained in detail here, because they can be found in numerous papers and even textbooks. As well as simple calculations like first differences or yearly growth rate, trend adjustments are often necessary. For the later task, filters are usually used. Some common filters are the Hodrick-Prescott filter, the Baxter-King filter, the Rotemberg filter, the Christiano Fitzgerald filter and the Kalman filter.[1] Since a quarterly or monthly frequency is pursued, often seasonal adjustments are required. For this task one

[1] See Hodrick and Prescott (1997), Baxter and King (1995), Rotemberg (1998), Lawrence and Fitzgerald (1999), Kalman (1960). Some recent discussions of filters can be found in Canova and Ferroni (2011).

can rely on standard international techniques like the CENSUS-X-12-Arima procedure, developed by the U.S. Bureau of Census[1].

For the construction of a high frequency reference series methods of temporal disaggregation are used. These methods are also well established, although not as broadly known as, for example, the above mentioned filter methods.

2.1. Collecting and Classification of Indicators

The sparse data environment is also characterized by a lack of established and sufficient data collections. So in the first step one has to brainstorm the possible data providers: statistical offices, ministries, national banks, private banks, market data, associations, large companies, like power suppliers, harbours etc. All possible informants of economic activities should be employed. Also in countries with statistical offices in development one can find a considerable amount of alternative data providers. Providers and their data should be collected very open mindedly.

There are various pieces of information that might be considered for the construction of indicators. Some examples of possible indicators are:

- Production, stock of orders, employment, unfilled job vacancies, new car registrations, housing starts, nights spent in hotels, electricity consumption, passengers at airports, air cargo, freight managed by harbours
- business tendency surveys
- consumer surveys
- various price figures and share prices, terms of trade, exchange rates, commodity prices like the copper price
- interest rates (spreads), bank credits
- indicators of other countries to capture foreign trade.

The indicators are enclosed step by step. This encapsulating has to be guided by the

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1 See Findley, Monsell, Bell, Otto and Chen (1998).

general characteristics of good indicators. Good indicators should be:

- meaningful und reliable
- timely available
- not revised considerably after publication
- leading or coincident for the business cycle, so that timely signals are given
- have a stable relationship with the reference series
- give clear signals with minor noise

With the help of the information collected, the indicators are classified into three categories. The categories consist of data which: 1) is not considered further, 2) maybe used for the temporal disaggregation of the reference series, 3) is regarded as a candidate for the composite indicator.

Data which is available only annually, which has no clear meaning and which comes from a non-reliable source should be excluded. Data which has a well-defined meaning and is reliable and available at least quarterly qualifies for group 2 or 3.

Since a composite business indicator must have a timely availability, the data used must be at hand with a minor publication lag and must not suffer from large revisions after first publication. Data not fulfilling these tough criteria for group 3 should be considered for group 2, however. Data of group 2 are used for the temporal disaggregation of the annual reference series. It is not necessary that the reference series is very timely, because it is used as a benchmark for the individual and for the composite indicator in the past. Meaningful, reliable, timely data which is not revised heavily is considered as a potential business cycle indicator. To assess these data with the help of statistical methods, a reference series for comparison is required. So after browsing for data and after the collection information, a reference series must be constructed for further considerations.

2.2. Construction of Reference Series

The sparse data situation is characterized by the lack of a high frequency reference series, e.g. a quarterly national accounts system is not available. Even when countries are just building up statistical offices and reporting systems they, often publish annual figures. These annual data are a very important anchor for a constructed quarterly or even monthly reference series. A temporal disaggregation method can be used to transform the annual figures into a high frequency reference series. In the case study, the well-established Chow and Lin procedure is applied.[1]

The reference series is needed for historical comparisons with the individual candidate indicators for the composite indicators. That's why also data that is not published in a timely fashion and that is revised later can be utilized at this step. This division of variables also has the important advantage that the data used for temporal disaggregation are different from the data used for the composite indicator. This makes the statistical comparisons reliable. In very special cases, however it is sensible to deviate from this principle and for temporal disaggregation to use indicators that are also candidates for the composite indicator. This means introducing some self-reference, which is softened by the annual anchor, however. This special situation occurs when a few sectors are of especially importance for the economy. This is true in our case study. The economy of Abu Dhabi is still quite dependent on oil. Hence, the price of oil is used for the temporal aggregation as well as for the construction of the composite indicator.

2.4. Assessment of Indicators

The collected indicators at this stage are already categorized by qualitative assessments, like publication lag. The candidates for the composite indicator are now assessed statistically. Before individual indicators can be compared with the reference series, it

[1] See Chow and Lin (1971).

must be determined whether some transformations are needed, such as seasonal adjustment, trend adjustment with the help of filters, annual differences or first differences. Since business cycles are fluctuations around a growth trend, business cycle indicators must be trend free. High frequency fluctuations with a frequency below one year (or usually 1.25 or 1.5 years) are not considered as business cycles. Seasonal fluctuations fall in this category.

The prepared individual indicators can be analyzed statistically. They can be visually compared with the reference series and cross-correlations have to be calculated. If there are already enough turning points within the time domain of the series, turning points can also be compared. Therefore mechanical dating algorithms like the Bry-Boschan dating procedure are suitable.[1] Also spectral and co-spectral analyses are valuable tools, when the data situation is sufficient.

These comparisons restrict the list of candidates further. In addition at this stage an iterative procedure begins. Pairwise correlations of the indicators should be inspected. Finally various types of composite indicators must be calculated and compared with the reference series. This process should lead to the composite indicator of choice.

Individual indicators can be combined in a composite indicator in various ways. The classical approach builds arithmetic averages of standardized indicators. This corresponds to weighting indicators by the reciprocal of its standard deviation. This is often a suitable approach in a sparse data situation. Alternative principal component analysis or static and dynamic factor analysis can be used.[2] Estimation of principal components and factors is often not robust with sparse data. The estimated loadings often fluctuate with every newly available piece of data.

[1] See Bry and Boschan (1971).

[2] See for example Schumacher (2007).

3. Case Study: A Composite Indicator for Abu Dhabi

As an example for the above described procedure, a composite indicator for the business cycle in Abu Dhabi is constructed. The data situation is characterized by a sparse data environment. GDP figures are available only annually and only in current prices. The country is currently building up a high quality statistical agency that uses international best practice methods. At the moment, however, the data situation is not very satisfactory.

For the construction of the composite indicator, various types of statistics and various data providers have been explored.

3.1. Selection of Reference Series

Abu Dhabi is an oil-based economy. As shown in Table 1, the share of the oil and gas sector in 2009 was almost 50% of nominal GDP (construction: 10.1%, financial institutions and insurance: 8.4%, manufacturing: 7.4%, transport, storage and telecommunication: 7.1%). From 2003 to 2008 the oil and gas sector contributed on average, 15.5 percentage points to the average growth rate of nominal GDP (23%).

Due to the high share of the oil sector, a business cycle concept based on capacity utilization and production could be misleading. Cycles in income, or real income, are a more suitable benchmark for economic activity. Real GDP underestimates the growth of real domestic income (GDI) whenever an increase of oil prices leads to an improvement in the external terms of trade (defined as the relation of export price indices to import price indices). An improvement in the terms of trade allows a country, ceteris paribus, to import more for its exports. Real GDP, which focuses on production per se, may be a misleading proxy for the measurement of purchasing power in an oil-rich country.

Table 1

Structure of Nominal GDP by Industries

	2001	2002	2003	2004	2005	2006	2007	2008*	2009**
Agriculture, live stock and fishing	3.2	3.3	2.7	2.1	1.5	1.1	1.0	0.8	1.0
Crude oil and natural gas	46.5	43.9	46.7	50.7	56.2	59.2	56.4	60.9	49.4
Manufacturing	9.3	9.2	8.5	8.0	7.5	6.7	6.5	5.8	7.4
Electricity, gas and water	2.0	2.0	2.4	2.3	2.3	2.1	2.3	2.1	2.8
Construction	8.1	8.3	8.1	7.2	6.9	7.5	8.6	7.9	10.1
Wholesale, retail trade and repairing services	7.1	7.6	7.0	6.1	5.2	4.6	4.8	4.3	5.5
Hotels and restaurants	1.2	1.2	1.1	1.0	0.9	0.9	0.9	0.8	1.2
Transport, storage and telecommunications	4.5	5.9	5.7	6.9	6.2	5.9	6.1	5.5	7.1
Financial institutions and insurance	7.4	7.9	8.0	7.3	6.7	6.4	7.4	6.5	8.4
Real estate and business services	2.8	3.0	2.9	2.6	2.1	1.7	1.7	1.6	2.1
Social and personal services	5.7	6.1	5.8	5.3	4.7	4.3	5.0	4.5	5.8
Public administration and defense	4.9	4.8	4.3	3.5	2.7	2.2	2.1	2.1	2.9
Domestic services of households	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.2
Less: Imputed bank services	3.2	3.7	3.6	3.1	3.0	2.8	3.0	2.9	3.9
GDP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Non-Oil GDP	53.5	56.1	53.3	49.3	43.8	40.8	43.6	39.1	50.6

*) Preliminary.-**) Estimated.

Source: Statistics Centre Abu Dhabi.

The distinction between real GDP and real GDI implies differences between the corresponding deflators for *nominal GDP*.[1] In order to measure real domestic income, a general price index should be used instead of the implicit *GDP deflator* P_{GDP}. Deflating nominal GDP with the price index of gross domestic final expenditure P_{DD}, for example, neutralizes a rise or fall of the prices of domestic demand, whereas the effects of changing terms of trade pass through. Whenever the terms of trade improve, the deflator for gross domestic final expenditure P_{DD} will show a lower inflation than the GDP deflator P_{GDP}, thus indicating an increasing purchasing power of the incomes generated by domestic production. The increase in real GDI is caused by higher nominal entrepreneurial profits and/or lower domestic prices for consumption or capital goods.

In the System of National Accounts (SNA), trading gains or losses from changes in the terms of trade are measured as the difference between exports and imports deflated by a common price index and exports and imports deflated by special export and import

[1] See Kohli (2004).

price indices.[1] Thus, using the deflator of gross domestic final expenditure P_{DD} as a general price index, the *terms-of-trade effect* T_{DD} is given by the expression

$$T_{DD} = (X - M)/P_{DD} - (X/P_X - M/P_M)$$

where X: nominal exports, M: nominal imports, P_X: price index of exports, P_M: price index of imports. T_{DD} is measured with reference to the price level to some specific base year.[2] Obviously P_X, P_M and P_{DD} equal 1 in the base year (which implies $T_{DD} = 0$).

It can be shown, that T_{DD} equals the difference between real GDI and real GDP: Nominal GDP is defined as C + I + X – M; where C: final consumption, I: gross capital formation, X: exports, M: imports. Following the traditional "fixed-weight" method in SNA, real GDP is measured by the aggregate $C/P_C + I/P_I + X/P_X - M/P_M$; with P_C: price index of consumption, P_I: price index of gross capital formation. If the price index of gross domestic final expenditure $P_{DD} = (C + I)/(C/P_C + I/P_I)$ is used as general deflator for nominal GDP, then real GDI is given by $C/P_C + I/P_I + (X - M)/P_{DD}$. Hence, the difference between real GDI and real GDP is given by $(X - M)/P_{DD} - (X/P_X - M/P_M)$, which equals the terms-of-trade effect T_{DD}.[3] When real GDP is calculated by a "chain-weight" method, a *relative* terms-of-trade effect ΔT_{DD} can be estimated as the *difference in growth rates* of real GDI and real GDP.

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1 See System of National Accounts (2008, p. 316).

2 The terms-of-trade effect in current prices is measured by $T_{DD}*P_{DD}$.

3 See Nierhaus (2000, p. 9).

Table 2

Real GDP, Real GDI and Terms-of-Trade Effect in the United Arab Emirates (a)

	2002	2003	2004	2005	2006	2007	2008	2009*	2010**
	Billion Dirhams								
Real gross domestic product (GDP)	668.6	727.5	797.1	835.8	918.5	948.1	979.3	963.5	977.3
Terms-of-trade effect	-73.7	-88.3	-99.3	-59.7	-16.1	0.0	63.1	-44.7	-42.9
Net exports deflated with a common index (1)	35.3	61.0	73.4	121.2	160.5	75.5	96.3	50.4	65.7
Real net exports	109.0	149.4	172.6	180.9	176.6	75.5	33.2	95.1	108.6
Real gross domestic income (GDI)	594.9	639.1	697.8	776.0	902.4	948.1	1,042.4	918.8	934.4
Memo: Terms-of-trade effect in current prices	-50.0	-63.1	-77.3	-51.1	-14.6	0.0	70.0	-48.3	-50.2
	Absolute change over previous year (Billion Dirhams)								
Real gross domestic product (GDP)	15.9	58.8	69.6	38.7	82.8	29.5	31.2	-15.8	13.8
Terms-of-trade effect	1.8	-14.6	-10.9	39.5	43.6	16.1	63.1	-107.8	1.8
Real gross domestic income (GDI)	17.7	44.2	58.6	78.2	126.4	45.7	94.4	-123.6	15.6
	Change over previous year (in %)								
Real gross domestic product (GDP)	2.4	8.8	9.6	4.9	9.9	3.2	3.3	-1.6	1.4
Terms-of-trade effect (2)	0.3	-2.5	-1.7	5.7	5.6	1.8	6.7	-10.3	0.2
Real gross domestic income (GDI)	3.1	7.4	9.2	11.2	16.3	5.1	10.0	-11.9	1.7

a) In constant prices of 2007.-*) Preliminary.-**) Estimated.
1) Deflated with the price index of gross domestic final expenditure.
2) Growth contributions to real gross domestic income in percentage points.

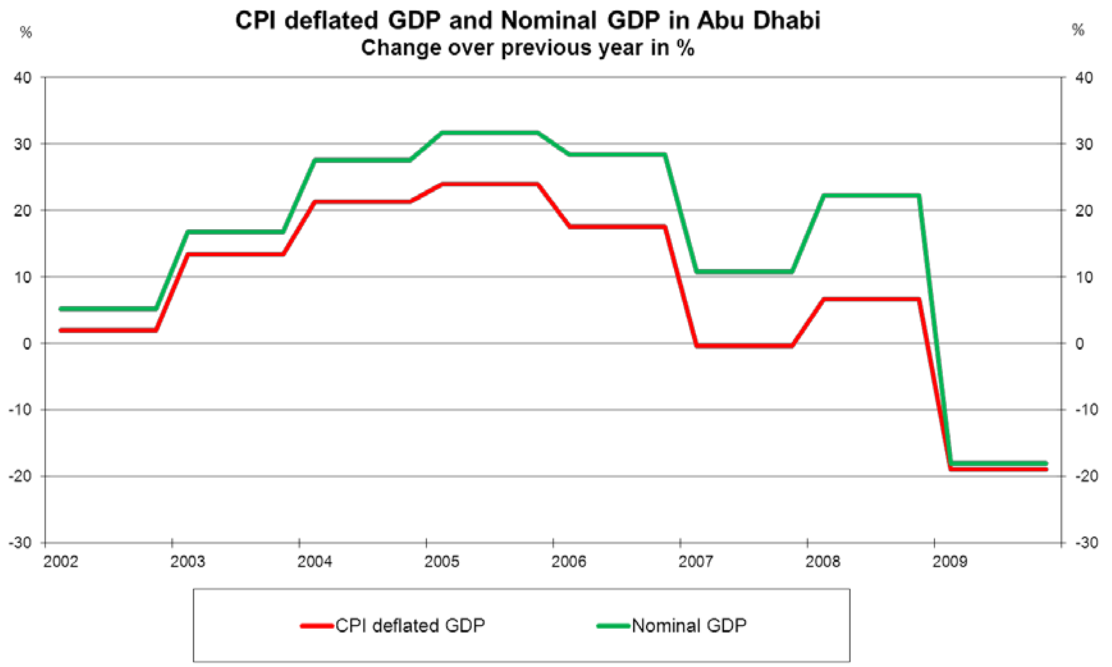
Source: National Bureau of Statistics, United Arab Emirates.

If imports and exports are large relative to GDP and if the commodity composition of imports and exports is very different, the scope for trading gains and losses is generally very large.[1] As can be shown for the United Arab Emirates (UAE), terms-of-trade effects contribute up to 67% of total GDI growth (2008). In contrast, the terms-of-trade effect in 2009 contributes 87% of the decline of real GDI (-11.9%). By definition, the terms-of-trade effect equals zero in the base year 2007 (see Table 2).

[1] See System of National Accounts (2008, p. 315).

For this reason a measure of real gross domestic income (GDI) was chosen as reference for the overall economic situation in Abu Dhabi. Due to the fact that price indices for GDP and its components are not yet released by the Statistical Center of Abu Dhabi, as proxy for P_{DD} the *consumer price index CPI* was used as a global price index for deflating nominal GDP. Hence, *CPI deflated GDP* is chosen as the starting point, by which real income effects due to price changes of consumer goods and services are neutralized. Nominal yearly GDP and CPI figures for Abu Dhabi were taken from the Statistical Centre of Abu Dhabi (Fig. 1).

Fig. 1

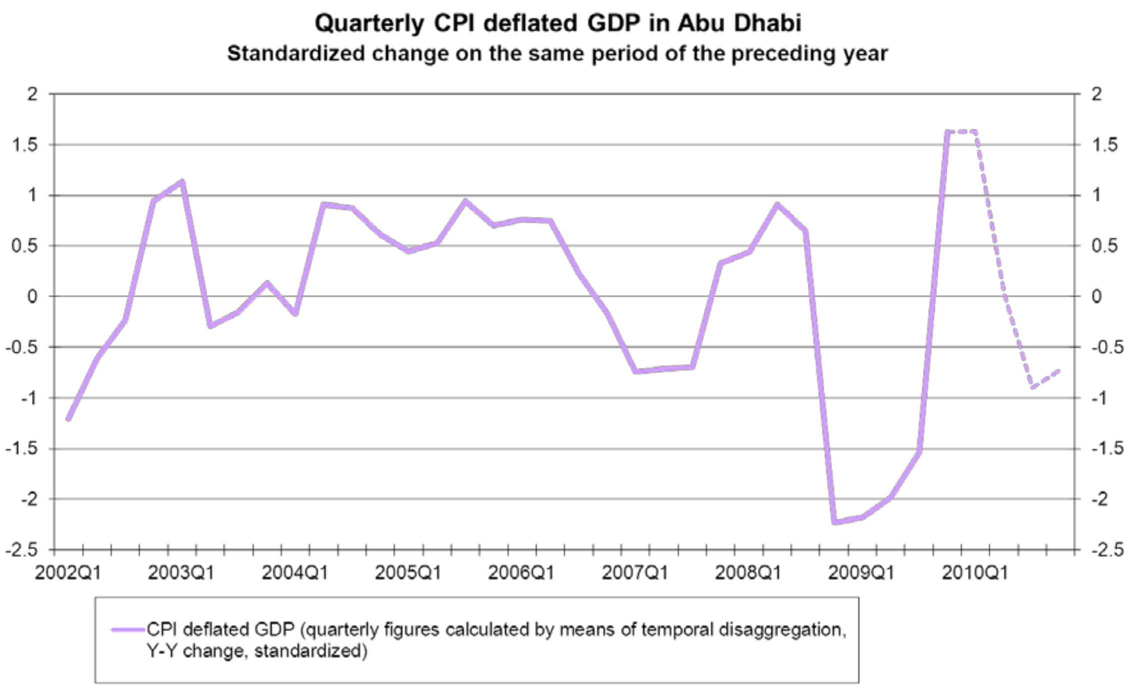


3.2. Derivation of Quarterly GDP by Temporal Disaggregation

Quarterly nominal GDP figures that are needed for the construction of the reference series are not yet available for Abu Dhabi. However, this problem can be overcome by statistical procedures called “temporal disaggregation methods”. For transforming annual GDP figures into higher frequency reference series the internationally established Cow and Lin procedure is applied.

The general idea behind this disaggregation method is as follows. A relationship between annual GDP and a suitable set of annualized high frequency indicators is estimated, usually with linear regression methods. Then the empirically based assumption is made that the estimated coefficients also hold on a finer time scale (in other words they function as another reference series). The high frequency indicators then can be utilized to estimate a high frequency GDP. An important feature of this method is that the annual GDP figures are maintained in the high frequency data. The indicators modulate the sub-annual development.

Fig. 2



The approach chosen for Abu Dhabi is based on a regression between the yearly oil price (spot Abu Dhabi) and the yearly nominal GDP. It is built on the hypothesis that the quarterly series of the oil price provides a correct depiction of quarterly series of nominal GDP. Finally, the quarterly estimations for nominal GDP are deflated with the quarterly consumer price index (CPI). Since oil prices in the course of 2010 are known, quarterly estimates of CPI deflated GDP for 2010 can also be derived in addition (Fig. 2).

3.3. Construction of the Composite Indicator

3.3.1 General Procedure

A well established international approach is using indicators for the timely assessment of economic activity. Zarnowitz (1996) writes: "Economic indicators, as a general category, are descriptive and anticipatory data used as tools for business conditions analysis and forecasting." The indicator approach consists of data chosen and prepared to monitor the business cycle evolvement, especially turning points in a timely fashion. A composite indicator combines several individual indicators to summarize the current economic condition – as shown by a reference series. Single indicators usually reflect the underlying business cycle development but are also affected by idiosyncratic factors. So the performance of individual indicators varies over time. The distorting effects of idiosyncratic factors can be reduced by combining single indicators into a composite indicator. This desired effect can be strengthened by giving higher weights to indicators with less idiosyncratic characteristics (historically/empirically proved/model based). Therefore, the composite indicators should, on average, give more reliable signals about the business cycle course than single indicators.

The composite indicator construction algorithm consists of the following steps:

In the beginning as many as possible indicators with a likelihood to provide actual information have to be collected and their characteristics be described. Then a first classification of the candidates must be made. A more sound assessment of indicators uses a statistical comparison with a reference series.

The single indicators that qualify for the construction of composite indicators must be selected by a stepwise procedure an in accordance with the general characteristics of good indicators.

Meaningful, reliable, timely data that are not revised heavily are considered as potential business cycle indicators. To assess these data with the help of statistical methods, as explained above, a reference series for comparison is required.

Before individual indicators can be compared with the reference series, one has to determine whether some statistical transformations are needed. Transformation requirements might be seasonal and trend adjustments. Since business cycles are fluctuations around a growth trend, business cycle indicators must be trend free (detrended). Also high frequency fluctuations with a frequency below one year (or usually 1.25 or 1.5 years) are not considered as business cycles. Seasonal fluctuations fall in this category.

For the development of the Abu Dhabi composite indicators only sound statistical methods are used. Simple calculations like first differences, yearly growth rates or trend adjustments often have to be done. A common filter applied for trend adjustment is the Hodrick-Prescott filter (HP filter). For seasonal adjustment a standard international technique, the X-12-ARIMA procedure, has been chosen.

The individual indicators prepared in this way can be analyzed statistically. They can be compared visually with the reference series and cross-correlations be calculated. These comparisons are used to restrict the list (numbers) of single indicators qualifying for the composite indicator.

3.3.2 The Composite Indicator

After choosing sensible transformation methodologies and processing through the selection method explained in section 2.1, the following individual quarterly indicators for Abu Dhabi were identified:

- Business startup permissions, (seasonally adjusted, HP detrended; source: ADCCI)
- Firms' assessment of current business situation (source: Business Tendency Survey of DED)
- Personal income, current situation (source: consumer survey of DED)
- Securities (quarterly averages, Y-Y change in %; source: Abu Dhabi Security Exchange), CPI deflated (source: SCAD and NBS)
- Oil price (spot Abu Dhabi, Y-Y change in %; source: IEA), CPI deflated. [1]

The calculation period for the indicators reaches from second quarter 2002 to first quarter 2011. For further processing, all time-series are standardized meaning each individual indicator X is transformed to $Z = (X - \mu)/\sigma$ with μ: mean and σ: standard deviation of the observed indicator values. All transformed indicators have a zero mean and a standard deviation of one.

In this example a further peculiarity occurs. The length of the time series differs substantially. Business and consumer surveys are introduced only for the year 2009. Results from these surveys are internationally established indicators and are very often used in composite indicators, the OECD[2] uses survey results quite often in its country indicators. For this reason these results are also introduced into the composite indicator for Abu Dhabi (Fig. 3).

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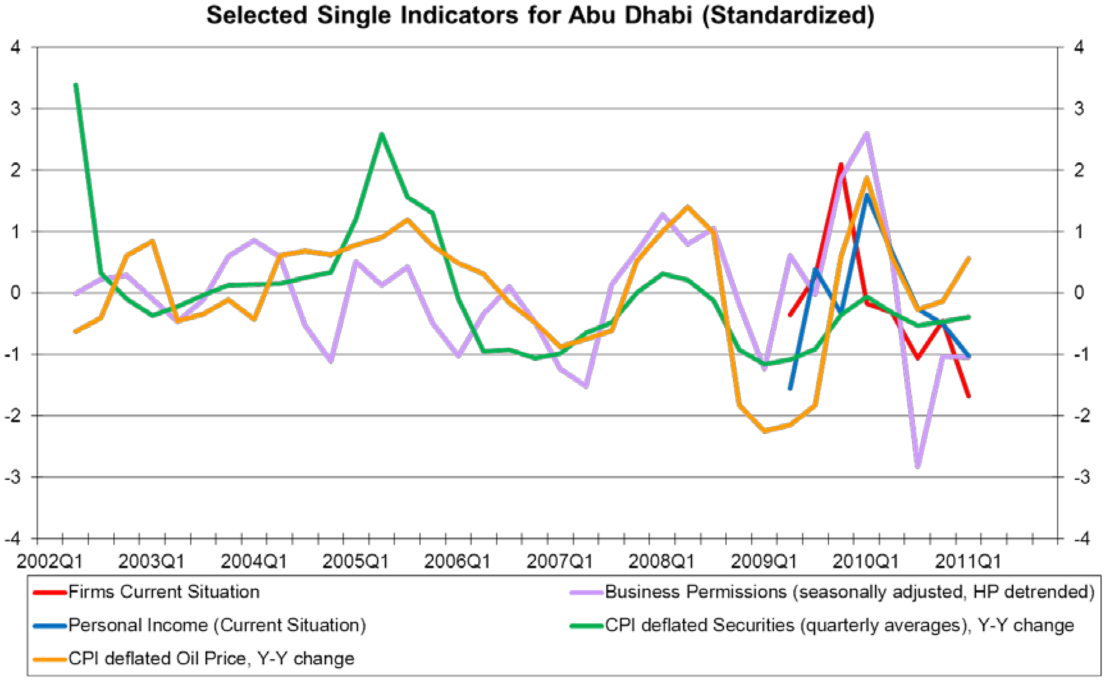
[1] ADCCI: Abu Dhabi Chamber of Commerce & Industry, DED: Department of Economic Development Abu Dhabi, SCAD: Statistical Centre Abu Dhabi, NBS: National Bureau of Statistics United Arab Emirates, IEA: International Energy Agency.

[2] A list of the component series for the country composite indicators of the OECD can be found at: http://www.oecd.org/document/29/0,3746,en_2649_34349_35725597_1_1_1_1,00.html (July 2011).

Fig. 3



The composite indicator (CI) for Abu Dhabi[1] is constructed by an equal weighting scheme of the standardized quarterly indicators (Fig. 4):

For t = II/2002 up to I/2009:

CI (t) = 1/3 • (business start-up permissions, CPI deflated securities, CPI deflated oil price)

For t ≥ II/2009:

CI (t) = 1/5 • [business start-up permissions, CPI deflated securities, CPI deflated oil price, assessment of firms current situation, assessment of personal income (current situation)]

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[1] The indicator was developed in the context of a Preparation & Training Mission to the Development Indicators & Future Studies Division (DED) in Abu Dhabi.

For calculating index values of the indicator, the quarterly values are all increased by 10 and normalized to the average of a base year (currently 2007).

Fig. 4

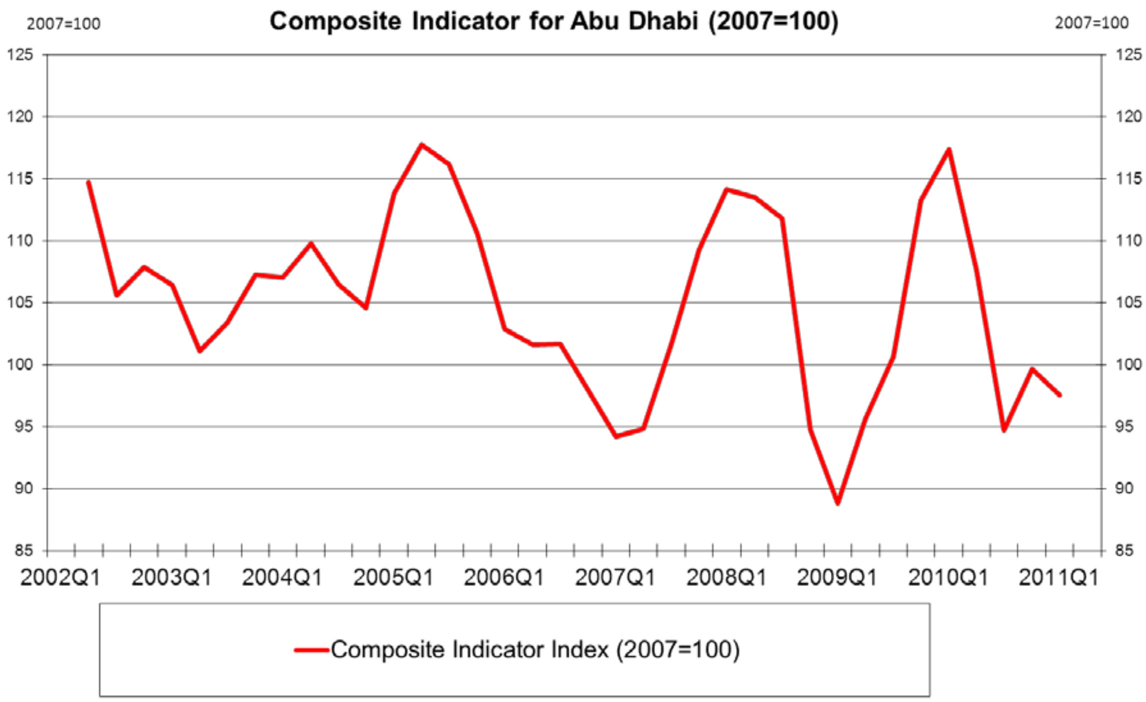


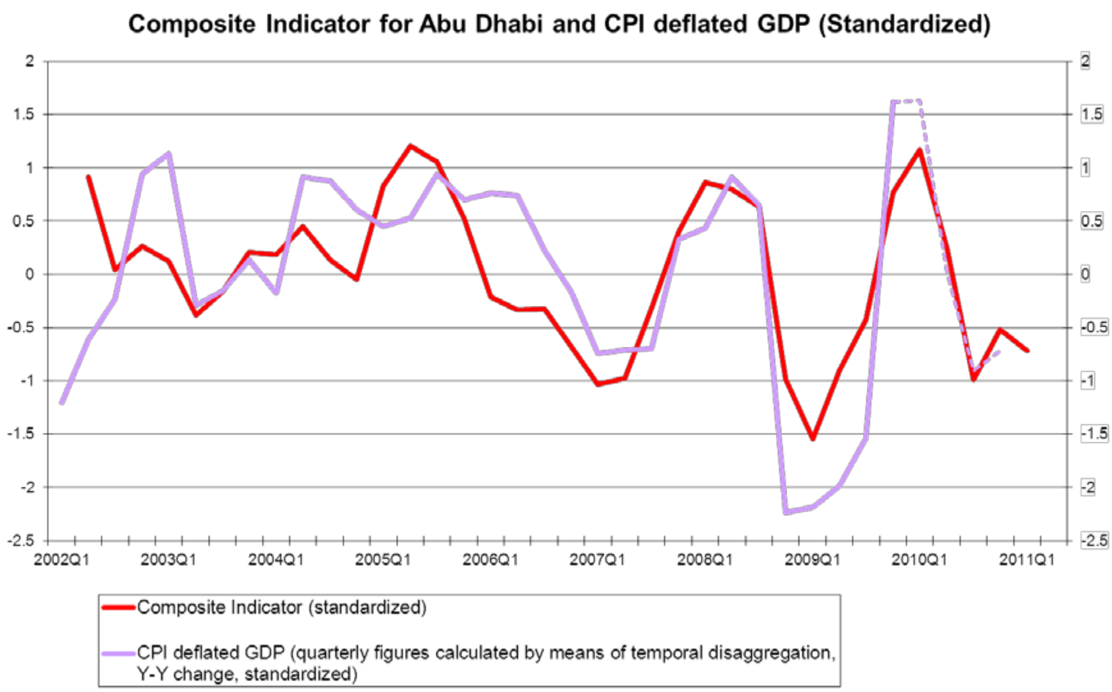
Figure 5 shows that the course of the composite indicator and the reference series in the period 2002 to 2010 is quite similar. The indicator tracks closely the cyclical behavior of the reference series. The cross-correlogram analysis for the years 2002–2010 shows a *coincidence* between the two series; the maximum correlation coefficient is achieved accordingly at a parallel course and amounts to 0.76.

4. Summary

Business cycle indicators are calculated for many countries. The indicators are important for the monitoring of the economic development in economies. They are closely watched by capital markets, by politicians and by the public.

Various econometric methods have been developed for the construction and optimization of business cycle indicators. Usually one relies on a sound statistical database when employing indicators. Many recent methodological developments try to capture large data sets. However, there are still countries where the data situation is not so rich. This paper deals with indicator development in a sparse data situation. No new methods are developed in this article, but known methods are combined in a new way. Indicator development is merged with temporal disaggregation, which is often used by statistical offices. Candidate indicators are classified and either abandoned, selected as candidate for the business cycle indicator or selected as candidate for the temporal disaggregation of a reference series.

Fig. 5



The discussed tools are applied in a case study. Despite the sparse data situation, a business cycle indicator for Abu Dhabi has been developed. The indicator can be assessed with the help of a quarterly reference series. Because the economy of Abu Dhabi is very dependent on oil, a further complication occurs. Real income reflects the economic situation better than production or GDP. For this reason a measure of real gross domestic income was chosen as reference for the overall economic situation. The developed indicator is a valuable improvement for business cycle analysis in Abu Dhabi. Results of national accounts are published only annually and with a publication lag of more than 18 months. Thus, a quarterly indicator, which is published a few days after the respective quarter, is an important addition of very timely information.

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