The Cyprus Composite Leading Economic Index (CCLEI)

Methodological Report

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What is a Composite Leading Economic Index (CLEI)?
The CLEI Index is designed to provide early warning signals for the turning points of business cycles i.e., early evidence of the turns in economic activity. This Index comprises of several leading economic activity variables whose changes tend to lead the changes in the overall economic activity and which are evaluated on a regular basis.

What are the components of the Cyprus Composite Leading Economic Index (CCLEI)?
The leading variables have been selected from a large pool of domestic and international leading indicators and are: the Brent Crude oil price, the Economic Sentiment Indicator (ESI) in Cyprus and the Euro Area, the total number of property sales contracts, the tourist arrivals, the value of credit card transactions, the retail trade sales turnover volume index, and the volume index of electricity production.

1. The Cyprus Composite Leading Economic Index (CCLEI)

The global financial crisis and COVID-19 pandemic along with uncertainty that continues to unfold globally, have revivified the interest in monitoring business cycles – contractions and expansions, and predicting their turning points. Composite Leading Economic Indices (CLEIs) implied first by Burns and Mitchell in 1946, are among the most important and common tools for tracking business cycles providing leading information of their turning points. Since then, the construction of CLEIs has been of great importance and interest at both national and international levels. International organizations such as the European Central Bank (ECB), the Organization for Economic Cooperation and Development (OECD), and the Conference Board (CB), as well as most developed countries, have constructed and estimated such indices to monitor systematically and anticipate both the phase of the business cycle and the short-run outlook of future economic activity. Consequently, the present study aims at estimating the corresponding monthly Composite Leading Economic Index for the Cyprus economy (CCLEI) in order to provide early warning signals for the turning points of the economic activity in Cyprus on a monthly basis.

CLEIs provide timely and relevant information on the current and future economic situation and thus provide an important contribution to short-term predictions of changes in the economy (Saltelli, 2007). They combine information from multiple leading indicators in a single indicator and can yield a more accurate prediction of the business cycles than a particular indicator since there is no single verified and accepted cause of all observed business cycles. The CCLEI not only combines the information from a small number of indicators but also takes advantage of their mixed sampling frequency given that some of these indicators use information being available at daily, weekly, or bi-weekly frequency and thus can provide more timely information. The leading indicators are selected from an extensive range of economic sectors and practices following a number of statistical tests and providing a strong and stable leading correlation for the GDP in Cyprus. The selected indicators that comprise the CCLEI are the Brent Crude oil prices, the Economic Sentiment Indicator in Cyprus and the Euro Area, total property sales of contracts, tourist arrivals, the value of credit card transactions, the retail trade sales turnover volume index, and the temperature-adjusted volume index of electricity production. Monthly data frequency is used for all components of the CCLEI, except the Brent Crude oil price which is considered at a weekly frequency, while the volume of electricity production and tourist arrivals utilize information being available at daily and bi-weekly frequency, respectively. Lastly, the GDP reference series is available at a low, quarterly frequency. All variables comprising the CCLEI are based on their most recent available data, but due to the ragged-edge structure of the data set, missing observations are filled with flash estimates based on the latest available information in a series of various economic indicators in order to improve the timeliness of the CCLEI.

The composition and estimation of the CCLEI follow a model-based approach proposed by Aruoba, Diebold, and Scotti (ADS) in 2009 – a model also applied by the Philadelphia Federal Reserve Bank for estimating the U.S. Business Conditions Index on a regular basis using various stock and flow data which are available at different and very high frequencies, such as daily and weekly. An appraisal of the statistical relationship between the CCLEI and the Cyprus GDP growth shows that the CCLEI based on the Aruoba, Diebold, and Scotti (ADS) method is significantly able to predict three quarters in advance the YoY GDP quarterly growth rate, while its last two monthly observations should be exploited through an unrestricted MIDAS model for nowcasting and forecasting the Cyprus economic outlook. Furthermore, the Diffusion Index constructed based on the Conference Board methodology (BCI Handbook (2001)) and computed based on the components of the CCLEI shows that the components comprising the CCLEI can consistently determine turning points in the economy and thus this proves their good historical performance in identifying business cycle chronologies and recessions. Consequently, the CCLEI is a reliable leading index of turning points in the Cypriot economy. Nonetheless, the monthly performance of the CCLEI will be monitored and updated regularly as well as its leading components. The monthly bulletin of the CCLEI has been published since 12 of December 2019, in which the index is re-estimated providing timely information

on the economic activity cycles in Cyprus. All monthly bulletins and the methodological report can be found at the CypERC official website.

2. Business Cycle Chronology of the Cyprus Economy

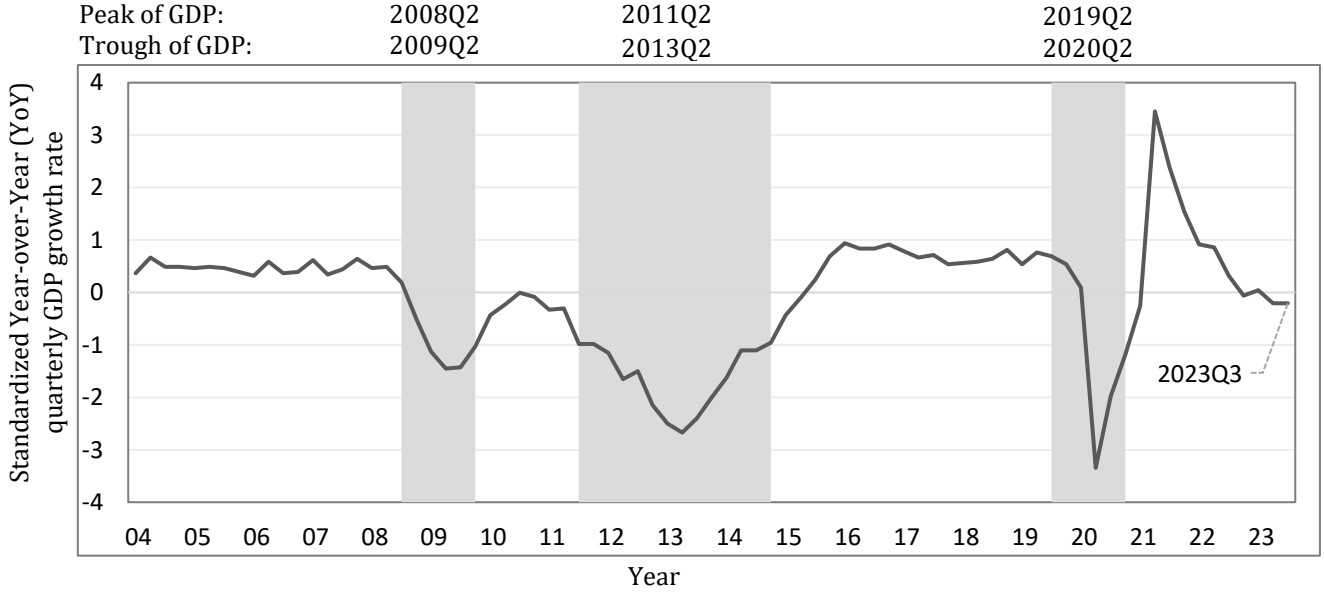
The primary challenge in developing composite indexes of leading economic indicators is defining a business cycle chronology. Determining peaks and troughs in the business cycle of an economy is vital since there would be no other way to evaluate the performance of a leading indicator at business cycle turning points. In general, three classifications within the literature provide definitions regarding the business cycle. The earliest classification, known as the "classical cycle" is determined by fluctuations in the level of economic activity and captures the Burns and Mitchell (1946) notion of a common business cycle and the National Bureau of Economic Research (NBER) coincident and leading economic indicators. Economic activity in market economies is portrayed by phases of upturns followed by phases of downturns (and reversely), which is demonstrated by the cyclical behavior and co-movements of many macroeconomic variables. If co-movements are persistent and strong, then the state of the economy can be represented by an index, the reference cycle, describing the common behavior of such variables. Sargent and Sims (1977) and Geweke (1977) through their dynamic generalization of the classic factor analysis model, modelled formally, among others, the particular notion of a common business cycle initiated by Burns and Mitchell. The second classification of business cycles which is an extension of the "classical cycle" approach is the "growth cycle" or "deviation cycle" and is defined by fluctuations in the economic activity around its long-run trend. Based on this classification we can differentiate periods below and above the trend growth and tuning points are determined by changes in the strength of economic activity growth relative to trend growth. This modified approach was first applied by Mintz (1969) and later by Klein and Moore (1985), where they identified growth cycles (or cycles in deviations from trend) in the post-World War II European economies that also exhibited strong growth trends and few business cycle recessions. The Organization for Economic Cooperation and Development (OECD) System of Composite Leading Indicators concentrates mainly on this classification of business cycles, as well as most of the recent literature such as Zarnowitz and Ozyildirim (2006) and Bondt and Hahn (2014), among others. Lastly, a third classification not so frequently used is the "growth rate cycle", which concerns fluctuations in the growth rate of economic activity. Based on this definition of business cycles, turning points signify a change from an increase in the growth rate to a decrease in the growth rate and vice versa.

In our procedure of constructing a Composite Leading Economic Index (CLEI) for the Cyprus economy, we have chosen to apply the most well-known and fundamental approach to classifying business cycles which has been also applied in Phillips, Vargas, and Zarnowitz (1996); the "classical cycle" definition of business cycles which focuses on fluctuations in the *level* of economic activity. Nevertheless, our approach differs in the sense that it takes into consideration two well-known business cycle dating methodologies. The first recession definition follows the Euro Area Business Cycle Dating Committee of the Centre for Economic Policy Research (CERP), stating that a recession starts just after the economy reaches a peak and ends when it reaches a trough of activity. The CERP recession is defined as a substantial decline in the level of economic activity and it is based on the trough method also used by the Federal Reserve Economic Database (FRED) to compute NBER recession periods for the U.S. The second recession methodology follows the conventional definition of economic growth downturn according to which the economy enters a recession when at least two consecutive quarters with negative economic activity growth rates are recorded. Combining these two approaches, we define the turning points of the reference series and its peaks and troughs and then we determine what indicators consistently lead the business cycle.

The reference business cycle variable, sometimes referred to as the coincident index should be an indicator that captures the overall economic performance and business cycle behaviour across the economy. If GDP could be available at a monthly frequency, we could not deny that it would be the best

representation of the overall movement in the economy. However, its lower frequency (i.e., quarterly) most of the time does not allow to take advantage of its importance, and as a result, many studies use other coincident indicators for determining turning points for a certain economy. For instance, the Conference Board has constructed a Composite Coincident Economic Index for the U.S. that consists of industrial production, retail trade, employment, and manufacturing turnover. Moreover, the OECD System of Composite Leading Indicators focuses only on total industrial production as reference series, whereas Bondt and Hahn (2014) for the construction of the Euro Area - Wide Leading Indicator (ALI) focus only on total industrial production but excluding construction. However, despite its low frequency, GDP is pondered as the most comprehensive economic indicator available, measuring the combined effects of the utilization of labor and capital and the productivity of these factors. We, therefore, agree with the statement of the NBER Business Cycle Committee that GDP is the single best measure of aggregate economic activity and use it as our reference series. Combining the two recession definitions discussed above, the Cyprus recession periods are defined as 2008Q3-2009Q4 (6 quarters), 2011Q3-2014Q4 (14 quarters), and 2019Q3-2020Q4 (6 quarters) as shown in Figure 1. The first Cyprus recession period, 2008Q3-2009Q4, is related to the 2007–2008 global financial crisis that started initially in the United States and triggered the worldwide economy including the European Union and Cyprus economies. The second Cyprus recession period, 2011Q3-2014Q4, is related to the well-known Cyprus financial crisis that occurred amid the vulnerability of Cypriot banks due to their extensive involvement with overleveraged local property companies, the consequences of the Greek government-debt crisis, and the downgrading of the Cypriot government's bond credit rating to junk status, among others. Finally, the most recent Cyprus recession period, 2019Q3-2020Q4, is attributed mainly to the global outbreak of the COVID-19 pandemic and its relative effects. Notably, over the past three years or so, the global economic activity has been portrayed by large fluctuations. In addition to the recent COVID-19 pandemic, Russia's war of aggression in Ukraine that began in February 2022, as well as the recent military conflicts in Israel that take place since 7 October 2023 have brought fresh unrest to the fore and pushed the already strained international geopolitical environment, negatively affecting the global economy. The recent decelarating quarterly year-over-year GDP growth rate in Cyprus, as shown in Figure 1, reflects the uncertain geopolitical and volatile economic environment prevailing globally, which inevitably negatively affects the growth prospects of the Cypriot economy.

Figure 1: The Economic Activity of Cyprus (GDP) and its Business Cycle Chronology



Source: Economics Research Centre (CypERC) - Department of Economics, University of Cyprus (UCY).
The graph presents the Year-over-Year (YoY) quarterly Gross Domestic Product (GDP) growth rate where the shaded areas represent recession periods defined following the CERP Euro Area Business Cycle Dating Committee in combination with the conventional recession definition of at least two consecutive negative YoY quarterly GDP growth rates.

3. Selection of the Leading Components

The Cyprus Composite Leading Economic Index is designed to provide information about the future direction of the economic activity in Cyprus and it comprises a number of financial and economic indicators which have been tested for their leading ability. Following the literature (e.g. Massimiliano (2006), Aruoba and Sarikaya (2013), Stock and Watson (1989), etc.) and considering Cyprus's specific economic characteristics, we have considered numerous indicators reported in the table of the Appendix. The indicators cover certain categories representing the macroeconomic activity of Cyprus which combine both hard macroeconomic and soft survey and financial data. In particular, the analysis of 113 quantitative and qualitative indicators of housing and construction, energy and production, tourism, consumption and trade, loans and new companies, Cyprus confidence indicators, foreign economic and sentiment indicators, exchange rates, the Cyprus stock exchange, and other Cyprus macroeconomic indicators was performed for the needs of the Composite Leading Indicator. Using preliminary tests, we focus on a smaller but significant set of components to construct a Composite Leading Indicator that provides a strong and stable leading correlation with the Cyprus GDP - the reference series, and extensive data availability. The final CCLEI which has been extensively examined in terms of robustness, comprises the following subset of leading variables reported in Table 1: the Brent Crude oil price (OIL), a weighted average of the Economic Sentiment Indicator in Cyprus (CYESI) and the Euro Area (EAESI), the total property sales of contracts (POL), the number of tourists arrivals (TOURA), the value of credit card transactions (CARDS), the retail trade sales turnover volume index (RETS), and the volume index of electricity production – adjusted with temperature (ELECT).

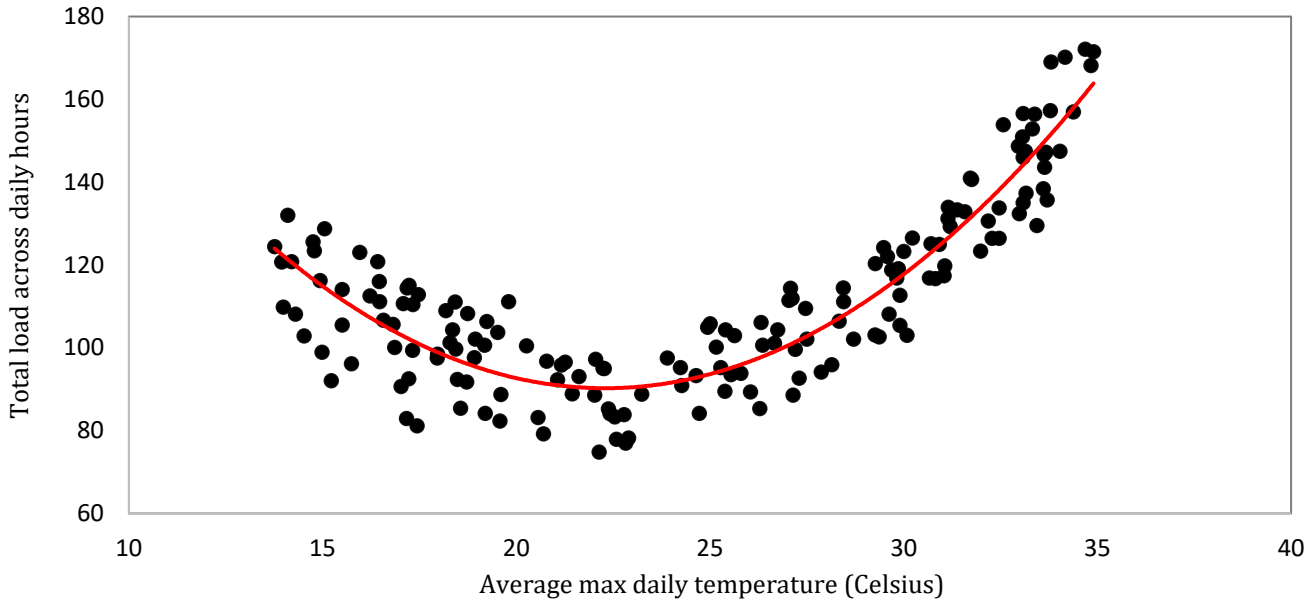
Table 1: Components of the Cyprus Composite Leading Economic Index (CCLEI)

Ordering	Frequency	Acronym	Description
1	Weekly	OIL	Brent Crude Oil Price (€)
2	Monthly	ESI	Weighted Average of the Economic Sentiment Indicator in Cyprus and the Euro Area
3	Monthly	POL	Total Property Sales of Contracts
4	Monthly	TOURA	Tourists Arrivals
5	Monthly	CARDS	Value of Credit Card Transactions
6	Monthly	RETS	Retail Trade, except of motor vehicles Turnover Volume Index
7	Monthly	ELECT	Temperature Adjusted Volume Index of Electricity Production

Source: Economics Research Centre (CypERC) - Department of Economics, University of Cyprus (UCY).

It is noted that the total property sales of contracts (POL) component has replaced the, earlier in-use, number of authorized building permits (BUILD) component due to more prompt release dates and more recent reference periods after an extensive evaluation of the index. Both the POL and the BUILD components belong to the same category "Housing and Building", and estimation results were found to remain robust when substituting the number of authorized building permits with the total property sales of contracts. Moreover, the weighted ESI used to compose the CCLEI consists of 70% of the Cyprus ESI and 30% of the Euro Area ESI, capturing confidence sentiment at some level also in the Euro Area. Different weights on the Cyprus ESI and the Euro Area ESI (i.e., 50%-50%, 60%-40%, 80%-20%, and 90%-10%) have also been considered in our analysis with, however, the ESI assigning a weight of 70% on the Cyprus ESI and 30% on the Euro Area ESI is providing a stronger leading predictor for the Cyprus economic outlook compared to the other Weighted Economic Sentiment Indicators. Last but not least, following McWilliams and Zachmann (2021), the volume index of electricity production is adjusted with temperature since the electricity load might alter significantly due to daily temperatures. In more detail, a polynomial function is used to estimate the relationship between the total electricity production across daily hours and the average maximum daily temperature for Cyprus. It is noted that based on the Akaike Info Criterion (AIC), Schwarz criterion (BIC), and the Hannan-Quinn criterion (HQ), as well as the statistically significant coefficients, the polynomial function considered is of order 2. The scatter graph (Figure 2) below represents the underlying relationship for the period starting from January 2000 until November 2023, where the fitted function (red line) is used for the adjustment of electricity with temperature.

Figure 2: Cyprus – model for temperature adjustment



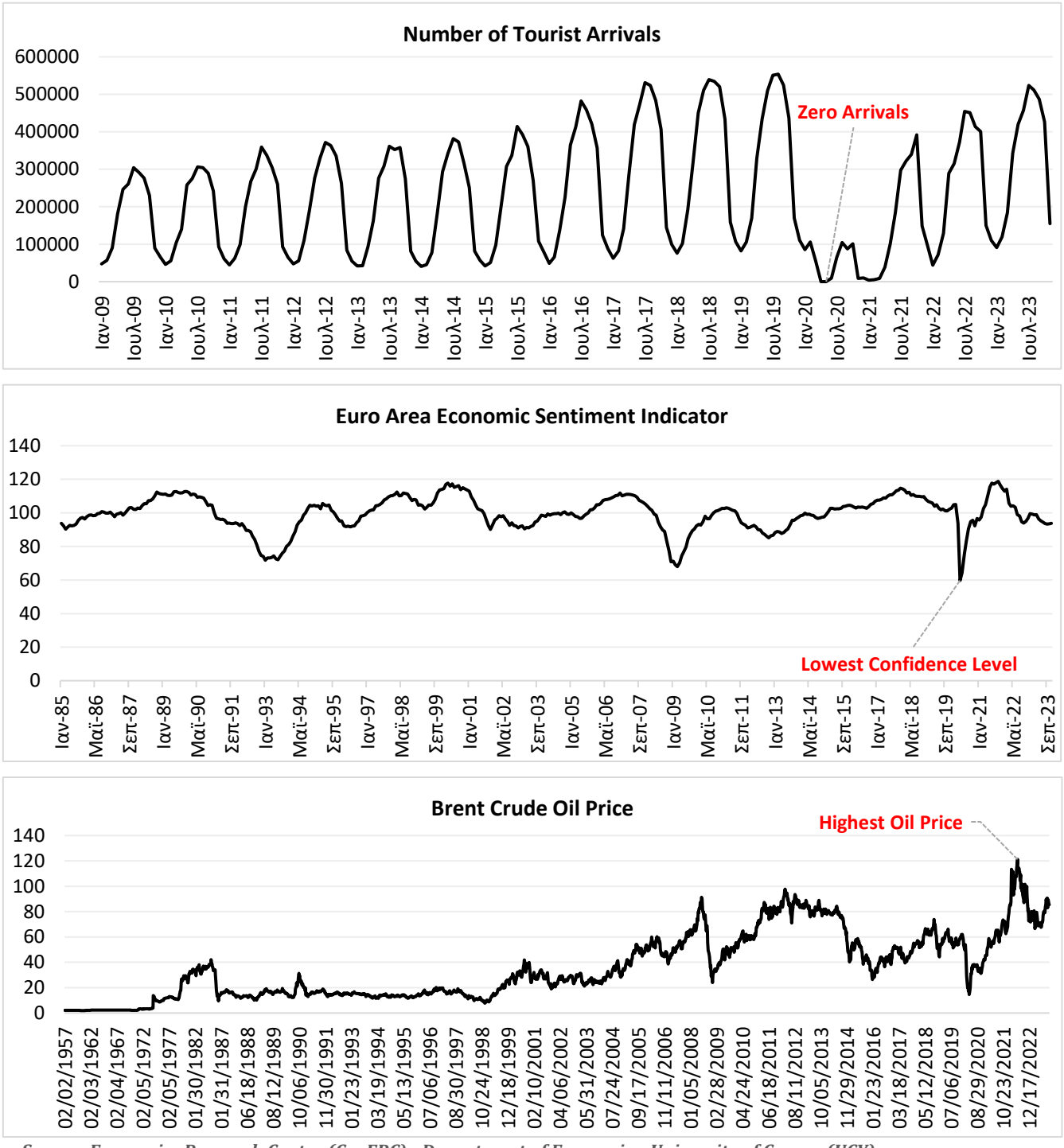
Source: Economics Research Centre (CypERC) - Department of Economics, University of Cyprus (UCY).

The Cyprus temperature data are taken from the Department of Meteorology in Cyprus which copes with issues related to the weather and climate of Cyprus. Data regarding the maximum/minimum temperature and precipitation are provided for specific regions of the Cyprus island, including Paphos, Prodromos, Athalassa, Larnaca, Limassol, and Paralimni, where the average maximum/minimum temperature across the daily temperatures is also provided per month. Comparing the growth rates of the electricity load – unadjusted with the growth rates of the electricity load adjusted with temperature, it turns out that weather fluctuations indeed affect to a great extent the electricity load. For instance, January 2021 was the warmest January since 2010 and thus the high positive year-over-year growth rate of electricity load in January 2022 amid the lower temperatures in January 2022 versus January 2021, is eliminated. The cooler January in 2022 vis-à-vis the January in 2021 led to higher production of electricity including air-conditioning and heading appliances in January 2022 compared to January 2021. As such, the temperature adjustment approach adjusts the year-over-year monthly electricity load growth rate, providing an accurate growth rate that does not depend on the weather. Similarly, March 2022 records the lowest temperatures since 2010; the high negative year-over-year monthly growth rate of the electricity load in March 2023 vis-à-vis March 2022 reflects the larger use of heating in March 2022 versus March 2023 which is purged with the temperature adjustment. Crucially, the high-frequency data regarding the daily production of the electrical system provided by the Cyprus Transmission System Operator that are available even at hourly frequency allow us to estimate the most recent monthly observations of the CCLEI's electricity component that based on the Statistical Service of Cyprus (CyStat) are made public with a delay. Subsequently, the monthly electricity observations are adjusted with the average maximum temperature per month.

Beyond electricity load, high-frequency information is also utilized for the estimation of missing observations regarding tourist arrivals. In particular, our analysis utilizes information from the passenger arrivals data that are confidentially available bi-weekly by the Department of Civil Aviation Cyprus as well as the information on daily traffic variation for the state of Cyprus provided by the European Organization responsible for the safety of air navigation – the Eurocontrol Government Agency. The last source of high-frequency information indicates the COVID-19 impact on the European air traffic network, showing that the tourism sector in Cyprus was influenced by both the coronavirus pandemic and the Russian invasion of Ukraine, recording zero arrivals of tourists during the pandemic crisis before recording zero arrivals of *Russian* tourists in Cyprus due to the Russia-Ukraine war. The coronavirus pandemic has been among the most severe crises worldwide, both for the economy and the wealth system, with uncertainty reaching its

highest levels. More precisely, uncertainty reached a peak in the Euro Area during the COVID-19 crisis, with the Economic Sentiment Indicator hitting its lowest level (i.e. 59.7) in April 2020 since January 1985 where sentiment data are available by the European Commission. Similarly, the energy sector was severely affected by the invasion of Ukraine by Russia with the international Brent Crude oil price jumping to its historically highest level during the second week of June 2022, surpassing even the corresponding prices of the oil crises of the 1970s. The consequences of the coronavirus pandemic on the tourism sector (zero arrivals) and the confidence in the Euro Area (highest uncertainty level), as well as the effects of the Russia-Ukraine war on the global energy sector (highest oil price), are visible on the following graphs (Figure 3):

Figure 3: The effects of the COVID-19 pandemic and the Russia-Ukraine war



Source: Economics Research Centre (CypERC) - Department of Economics, University of Cyprus (UCY).

When it comes to the choice of the leading components for composing a Leading Economic Indicator, the literature shows that most of the variables considered as leading components in our analysis have been also utilized in a variety of other studies for the construction of composite leading indicators across many countries. For example, the Economic Sentiment Indicator (ESI) is included as a component of the Euro Area-wide Leading Indicator (ALI) (Bondt and Hahn (2014)) and the Conference Board Leading Economic Index™ for the Euro Area. Notably, the ESI and its components have been generally used in many studies as leading indicators since the ESI Index can be considered a statistically significant indicator of GDP development which might be also used to construct model relationships for flash estimates of GDP (Ján Haluška, 2006). Additionally, one of the biggest advantages of using "soft data" is that they are available much earlier than the classic "hard data" coming from national accounts or output of the economy, and thus survey data have been extensively used for forecasting GDP all over the world (Garnitz, Lehmann, and Wohlrabe (2019)). Interestingly, although not having the highest weight on the general sentiment index, the Consumer Confidence Indicator is the component of ESI that has been used more than any other component for the composition of leading indicators (see for example the Conference Board Leading Economic Index for Germany and the UK). Moreover, some of the domestic series such as electricity production and retail trade volume feature in the OECD leading indicators for most of the European countries. Furthermore, data regarding credit cards and oil prices were used by Bruno Eklund (2007) for the construction of a leading indicator for the economy of Iceland, while data regarding sales contracts were used by Phillips, Vargas, and Zarnowitz (1996) for analyzing the Mexican economy. Finally, we have considered arrivals of tourists in the composition of the CCLEI since tourism is a vital economic sector for the Republic of Cyprus; the GDP of Cyprus is generated by approximately 20% from activities related to the tourism sector, according to the Official Website of the International Trade Administration.

Last but not least, different frequencies are enhanced in our analysis exploiting the higher frequency data and information provided by several useful economic variables. In particular, as already stated monthly data frequency is used for all components of the CCLEI, except the Brent Crude oil price which is considered at a weekly frequency, while the volume of electricity production and tourist arrivals utilize information being available at daily and bi-weekly frequency, respectively. All variables comprising the CCLEI are based on their most recent available data, but due to the ragged-edge structure of the data set, missing observations are filled with flash estimates based on a set of various indicators to improve the timeliness of the CCLEI. McGuckin, Ozyildirim, and Zarnowitz (2007) showed that although using actual data avoids any errors inevitably associated with forecasting, a timelier leading indicator offers substantial gains. The data for all series are adjusted for seasonal effects and potential outliers before composing the index, where outlier observations are adjusted to the median value of the data series. For the seasonal adjustment of the series, the following approaches have been considered: the conventional seasonal dummy approach, the X-13 approach using the X-11 ARIMA method, the X-13 approach using the TRAMO/SEATS ARIMA method, and the Season-trend Decomposition (STL) approach. All approaches were found to provide similar estimation results with highly correlated seasonally adjusted series and thus we have chosen to apply the classical standard dummy approach for seasonal adjustment. Data sources of all the series considered in the analysis can be found in the relevant table in the Appendix.

4. Composite Indicators

In general, composite indicators can be constructed using either model-based approaches (e.g. Aruoba, Diebold, and Scotti (ADS) developed in 2009, Stock and Watson (1989), and Massimiliano (2006)) or simple aggregation schemes (e.g. Conference Board (CB) developed in 1995, and the OECD system developed in 1970). In the case of simple aggregation techniques, composite indicators can be constructed using different accumulation methods and weighting schemes which can subsequently produce different patterns of the composed indicators. In the case of model-based approaches, there are three main categorizations of methods; methodologies based on linear models, non-linear models, and pooling techniques. Bearing in mind linear models, Dynamic Factor Models (DFM) have appeared to be the foremost approach for the construction of composite indicators. When considering non-linear models, binary regressions such as LOGIT and PROBIT, non-linear time series models, and neural network techniques (see

Jagric 2003) have been the most extensively used. Lastly, pooling techniques suggest combining a set of competing composite indicators to improve the quality and performance of every single composite indicator. On the other hand, one of the most well-known aggregation scheme techniques is the Conference Board (CB) approach developed in 1995 by the Bureau of Economic Analysis of the U.S. Department of Commerce (BCI Handbook (2001)). Within the NBER and the Conference Board (CB) approach, composite coincident, leading, and lagging indexes are constructed as equally weighted averages of the components' symmetric monthly growth rates. Components' symmetric monthly growth rates (which are essentially equivalent to log differences) are first volatility adjusted using inverse standard deviations of the monthly symmetric changes in the components and then normalized to sum to one. The monthly growth rate of the index obtained in the previous step is cumulated to obtain levels of the index and this is then re-based to a fixed base year. As stated in the Handbook on Cyclical Composite Indicators for Business Cycle Analysis of Eurostat in 2017, the use of these composite indexes is consistent with the "cyclical cycle" developed by Burns and Mitchell, in which they uncovered convincing common turning point patterns within a set of economic indicators compared to the pattern of any individual predictor.

The broader range of cyclical indicators for the "classical cycle" and the "growth cycle" is put forward by the Conference Board (CB) and the OECD system, respectively. The OECD System of Composite Leading Indicators (CLIs) was first developed in the 70s as a result of the 1969-1970 recession in most of the developed economies. In fact, the deeper and even more global recession that followed in the mid-70s armor-plated the need for a tool that provides early warning signals of turning points in the economy. "OECD CLIs were constructed to predict cycles in a reference series chosen as a proxy for economic activity, where fluctuations in economic activity are measured as the variation in economic output relative to its long-term potential level", as stated in the OECD system of Composite Leading Indicators (2012). One of the main advantages of the CB and the OECD estimated composite indicators is the allowance for a comprehensive cross-country comparison as they are based on the same methodology. A similar approach to the OECD is applied by Bondt and Hahn (2014) for the construction of the Euro Area - Wide Leading Indicator (ALI) but using a different filter for detrending the series. The Hodrick-Prescott (1997) (HP) filter is used by the OECD System (2012), while the Christiano and Fitzgerald filter (2003) is used for de-trending the series in the construction of the Euro Area - Wide Leading Indicator (ALI) indicator. Furthermore, numerous composite coincident and leading indicators for several countries using simple aggregation schemes are provided by the Economic Cycle Research Institute (ECRI).

Within the model-based procedures, dynamic factor linear models have been widely used for composing economic indicators. In particular, Stock and Watson (1989, 1991, and 1992) used a dynamic factor model to extract coincident and leading indicators. Their approach underlines the Burns and Mitchell (1946) concept that business cycles represent co-movements in a set of series since it establishes that all the coincident/leading indicators are driven by a common force, the composite indicator, and by idiosyncratic components that are either unrelated across the variables or anyhow related to a limited subset of them. Their construction of a leading economic index deals with an estimate of the growth rate of the coincident index aiming to confirm the original NBER view according to which an economic leading indicator should provide a measure with the feature to anticipate the reference cycle by several months. However, a major difference among them is that Stock and Watson's view is based on measures of growth rates, whereas the NBER approach is based on measures in terms of levels. Furthermore, in contrast to Stock and Watson (1989), the Hamilton (1989) Markov switching model allowed for the growth rate of the variables to be contingent on the status of the business cycle instead of using a constant parameter model. The two modelling approaches thus encapsulate two complementary and basic features of business cycles: the co-movements across many series and the asymmetric behaviour of some indicators during expansions and recessions.

A point worthy to be mentioning is that the number of indicators used to compose the leading indicator has been constantly debated over the past years causing the methodologies to be split into two categories determined by the size of the pool of explanatory predictors taken into consideration. For instance, Stock and Watson (1991), Aruoba, Diebold, and Scotti (2009), and Aruoba and Diebold (2010) are

among the studies that have considered a small number of sensibly selected explanatory predictors. Within their approach, small-scale dynamic (or static) factor models are used under the assumption of non-cross-correlated idiosyncratic errors. On the other hand, Stock and Watson (1998, 2002) used a large number of estimated predictors for the forecasting of macroeconomic time series, where the predictors were constructed using a small number of indexes by Principal Component Analysis (PCA). Their estimated forecasts were found to outperform the benchmark forecasts such as small vector autoregressions, univariate autoregressions, leading indicator models, as well as the unemployment-based Philips curve model for inflation. However, a more recent study by Bai and Ng (2008) provides the forecasting improvements attained when using "targeted predictors". More specifically, Bai and Ng in their work extended the linear principal components analysis by facilitating a more flexible factor structure, in which only significantly informative predictors are considered. More precisely, they set as their primary objective the reduction of predictors that were not considered as informative using 'hard' and 'soft' thresholding; they applied the corresponding principal component analysis to 'targeted predictors' selected according to hard and soft thresholding rules. The main findings of their research were the forecasting improvement when using targeted predictors conditional on both soft and hard thresholding compared to the no-targeting predictors. Consequently, we choose to apply the proposed framework by Aruoba, Diebold, and Scotti (ADS) in 2009 using the small but nevertheless statistically significant set of leading predictors reported in Table 1 for constructing a Composite Leading Economic Index for the Cyprus economy (CCLEI).

4.1. A Composite Leading Economic Index for the Cyprus Economy (CCLEI) – The Aruoba, Diebold, and Scotti (ADS) Approach

The Aruoba, Diebold, and Scotti (ADS) (2009) methodology has been used by the Philadelphia Fed for estimating the U.S. Business Conditions Index regularly using various stock and flow data which are available at different and very high frequencies, such as daily and weekly. This methodology assumes that the index is a function of a small-data dynamic factor model stating that the business cycle does not portray a single indicator but depicts the dynamics and co-movements of many variables. The model recognizes the ability of the business conditions indicators to arrive at a diversity of frequencies, encompasses them, and thus allows them to provide unremittingly updated high-frequency information. Moreover, it extracts and forecasts latent business conditions using linear yet statistically optimal techniques, which are model-based and involve no approximations. Since this methodology is based on a dynamic model, it is necessary to assume a particular ordering of the variables (see Table 1) based on the date of the data releases and frequencies. All seasonally and outlier adjusted variables considered in the model are initially converted to annualized weekly/monthly growth rates except for the weighted Economic Sentiment Indicator consisting of 70% of the Cyprus ESI and 30% of the Euro Area ESI which is just divided by 100. The transformations of the source input data for the ADS index reflect two important considerations: stationarity and scale. For reasons of stationarity, we transform all variables, except the weighted ESI, to annualized period-over-period growth rates (expressed in percentage points, not percent). However, we divide the weighted ESI by 100 so that all variables, the weighted ESI, and growth rates, have a similar scale prior to estimating the parameters of the state-space representation. Crucially, estimation in these models can be difficult, often characterized by non-convergence, when the source data have radically different scales. Finally, the Kalman filter and smoother is used to obtain optimal extractions of our monthly Index – the CCLEI.

4.2. The Aruoba, Diebold, and Scotti (ADS) (2009) Modelling Framework

The ADS approach of Aruoba, Diebold, and Scotti (2009) is based on a dynamic factor model of stock and flow variables at a very high frequency, i.e. daily. Let x_t denote business conditions at day t, which evolve daily with AR(p) dynamics:

$$x_t = \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \cdots + \alpha_\rho x_{t-\rho} + e_t, \quad (1)$$

where, e_t is a white noise innovation with unit variance, and x_t is a scalar since we use a single-factor model. Let y_t^i denote the *i*th daily economic or financial variable at day *t*, which depends linearly on x_t and possibly also on various exogenous variables and lags of y_t^i:

$$y_t^i = c_i + \beta_i x_t + \delta_{i1} w_t^1 + \cdots + \delta_{ik} w_t^k + \gamma_{i1} y_{t-D_i}^i + \cdots + \gamma_{in} y_{t-nD_i}^i + u_t^i, \tag{2}$$

where the w_t are exogenous variables and the u_t^i are contemporaneously and serially uncorrelated innovations. The lags of the dependent variable y_t^i are introduced in multiples of D_i, where $D_i > 1$ is a number linked to the frequency of the observed y_t^i. However, because most variables, although *evolving* daily, are not actually *observed* daily, let $\tilde{y}_t^i$ denote the same variable observed at a lower frequency (call it the "tilde frequency"). The relationship between $\tilde{y}_t^i$ and y_t^i depends crucially on whether y_t^i a stock or flow variable. If y_t^i is a stock variable measured at a nondaily tilde frequency, then the appropriate treatment is straightforward, because stock variables are simply point-in-time snapshots. At any time t, either y_t^i is observed, in which case $\tilde{y}_t^i = y_t^i$, or it is not, in which case $\tilde{y}_t^i = NA$, where NA denotes missing data ("not available"). Hence the stock variable measurement equation is:

$$\tilde{y}_t^i = \begin{cases} c_i + \beta_i x_t + \delta_{i1} w_t^1 + \cdots + \delta_{ik} w_t^k + \gamma_{i1} y_{t-D_i}^i + \cdots + \gamma_{in} y_{t-nD_i}^i + u_t^i, & if\ y_t^i\ is\ observed \\ NA\ otherwise. \end{cases} \tag{3}$$

Now consider flow variables. Flow variables observed at nondaily tilde frequencies are intraperiod sums of the corresponding daily values,

$$\tilde{y}_t^i = \begin{cases} \sum_{j=0}^{D_i-1} y_{t-j}^i, & if\ y_t^i\ is\ observed \\ NA \quad otherwise, \end{cases} \tag{4}$$

where, D_i is the number of days per observational period (e.g., $D_i = 7$ if y_t^i is measured weekly). Combining this fact with Equation (2), the flow variable measurement equation is:

$$\tilde{y}_t^i = \begin{cases} \sum_{j=0}^{D_i-1} c_i + \beta_i \sum_{j=0}^{D_i-1} x_{t-j}^i + \delta_{i1} \sum_{j=0}^{D_i-1} w_{t-j}^1 + \cdots + \delta_{ik} \sum_{j=0}^{D_i-1} w_{t-j}^k + \gamma_{i1} \sum_{j=0}^{D_i-1} y_{t-D_i-j}^i \\ \qquad + \cdots + \gamma_{in} \sum_{j=0}^{D_i-1} y_{t-nD_i-j}^i + u_t^{*i}, \qquad if\ y_t^i\ is\ observed \\ NA\ otherwise, \end{cases} \tag{5}$$

where, $\sum_{j=0}^{D_i-1} y_{t-D_i-j}^i$ is by definition the observed flow variable one period ago ($\tilde{y}_{t-D_i}^i$), and u_t^{*i} is the sum of the u_t^i over the tilde period. Note that in general D_i is time varying, as, for example, some months have 28 days, some have 29, some have 30, and some have 31. To simplify the notation above, D_i is assumed to be fixed. Additionally, note that although u_t^{*i} follows a moving average process of order $D_i - 1$ at the daily frequency, it nevertheless remains white noise when observed at the tilde frequency, due to the $(D_i - 1)$-dependence of an $MA(D_i - 1)$ process. Hence u_t^{*i} is appropriately treated as white noise in what follows, where $var(u_t^{*i}) = D_i \cdot var(u_t^i)$.

The exogenous variables w_t are the key to handling trend. In particular, in the important special case where the w_t are simply deterministic polynomial trend terms $[w_{t-j}^1 = t - j, w_{t-j}^2 = (t-j)^2]$ and so on we have that:

$$\sum_{j=0}^{D_i-1} [c_i + \delta_{i1}(t-j) + \cdots + \delta_{ik}(t-j)^k] \equiv c_i^* + \delta_{i1}^* t + \cdots + \delta_{ik}^* t^k. \tag{6}$$

Assembling the results, the stock variable measurement equation is

$$\tilde{y}_t^i = \begin{cases} c_i^* + \beta_i x_t^i + \delta_{i1}^* t + \cdots + \delta_{ik}^* t^k + \gamma_{i1}\tilde{y}_{t-D_i}^i + \cdots + \gamma_{in}\tilde{y}_{t-nD_i}^i + u_t^{*i}, & if\ y_t^i\ is\ observed \\ NA\ otherwise, \end{cases} \quad (7)$$

and the flow variable measurement equation,

$$\tilde{y}_t^i = \begin{cases} c_i^* + \beta_i \sum_{j=0}^{D_i-1} x_{t-j}^i + \delta_{i1}^* t + \cdots + \delta_{ik}^* t^k + \\ \qquad \gamma_{i1}\tilde{y}_{t-D_i}^i + \cdots + \gamma_{in}\tilde{y}_{t-nD_i}^i + u_t^{*i}, \quad if\ y_t^i\ is\ observed \\ NA\ otherwise, \end{cases} \quad (8)$$

which completes the specification of the model and has a natural state-space form.

5. The Leading Behaviour of the CCLEI and its Components

To determine the statistical relationship between the CCLEI and GDP growth, Pearson's correlation coefficient test with backward and forward shifts has been used (Tkacova, Gavurova, and Behun (2017)). Correlation coefficients are calculated between standardized Year-over-Year (YoY) quarterly changes in the GDP growth and past and future standardized YoY quarterly changes in the component series and the CCLEI. A statistically significant correlation between differences in a component of the CCLEI or the CCLEI and differences in the GDP growth at a zero lag provides a signal that the particular component of the CCLEI or the CCLEI is consistent with changes in the GDP growth. Similarly, statistical significance at lead (lag) quarters provides evidence of business cycle obedience with a leading (lagging) relationship. Following the underlying approach, the CCLEI is found to be statistically significant for up to three lead quarters, while diverse statistically significant leading behaviour is also confirmed for the majority of the CCLEI's components. Note that, the same results arise when considering the unstandardized changes rather than the standardized changes in the GDP growth and the CCLEI and its components. While Pearson's coefficient estimation shows the association between the GDP growth and the CCLEI and its components for each lead/lag length singly, we also evaluated the relative statistical relationship using mixed-frequency models. In particular, we estimated the Unrestricted MIxed DAta Sampling ($UMIDAS$) models proposed by Foroni et al. (2015) following the advantages gained by the corresponding models when the differences in sampling frequencies among the regressand and the regressors are small. In our case, the GDP growth is available at low quarterly frequency, while monthly frequency data are considered for all the components of the CCLEI for this particular analysis. Note that, although oil prices are used at a weekly frequency in the state-space model for the estimation of the CCLEI, their monthly frequency is considered in the UMIDAS model to avoid the parameter proliferation problem that arises when differences in sampling frequency between the regressand and the regressors are large. The single high-frequency regressor Autoregressive Distributed Lag (ADL) $UMIDAS$ ($ADL-UMIDAS$) model for forecasting h-steps ahead the low-frequency YoY quarterly GDP growth, GDP_t^L, based on a high-frequency monthly Leading Economic Indicator (LEI) is:

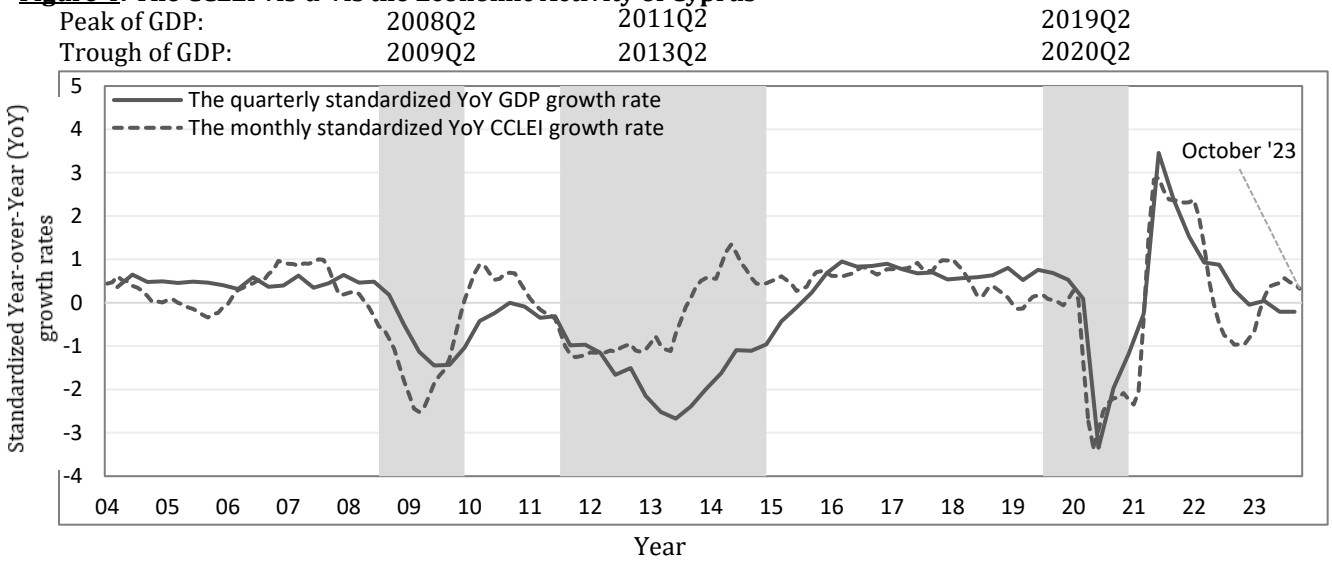
$$GDP_{t+h}^L = a_h + \sum_{i=1}^{p} \lambda_{h,i} L^i GDP_t^L + \sum_{k=0}^{m\widetilde{K}} w_{h,k} LEI_{t-k/m}^H + \varepsilon_{t+h}^L, \quad (9)$$

where the LEI is either the CCLEI or a leading component. The number of months per quarter and the number of high-frequency monthly lags of the regressor are denoted by m and $k = 0, \dots, m\widetilde{K}$, respectively, p is the number of low-frequency quarterly lags of the YoY GDP growth, GDP_t^L, and L^j is the lag operator for the low-frequency quarterly data. Substantially, $\widetilde{K}$ is such that the error term, ε_{t+h}^L, is uncorrelated and the parameter proliferation problem is not present, while the weights, $w_{h,q}$, assigned to each high-frequency monthly observation are different considering the time-series behaviour of the data. It is noted that, the maximum number of quarterly lags of the low-frequency YoY GDP growth, GDP_t^L, is four in order to include maximum the last year's quarterly data, while the maximum number of monthly lags of the high-frequency YoY LEI growth, $LEI_{t-q/m}^H$, is correspondingly twelve. Equation (9) shows that in the case of a $UMIDAS$

model an Ordinary Least Squares (OLS) estimation can be applied and thereby the optimal number of both the low- and high-frequency quarterly and monthly lags can be chosen based on information criteria (in our case the Schwarz Criterion (BIC) due to its more extensive penalty term) and serial correlation tests.

The estimated high-frequency monthly coefficients based on the $ADL - UMIDAS$ models chosen by the BIC criterion for the CCLEI represent the cross-correlation value, where the precondition for cyclical indicators is the position of the highest statistically significant cross-correlation value at time t to $t - \widetilde{K}$. The BIC criterion yields the lowest value for the $ADL - UMIDAS$ model with two lead months for the CCLEI indicating its statistically significant ability to nowcast and predict the YoY quarterly GDP growth using only the last two monthly observations of the YoY monthly CCLEI growth. Notably, both the first and second YoY monthly lags of CCLEI growth are statistically significant at a 1% significance level. The results show that in addition to the statistically significant leading ability of the CCLEI for up to three lead quarters based on Pearson's approximation correlation test that considers the same sampling frequency between the GDP growth and the CCLEI, the latest two monthly observations of the YoY CCLEI growth can be exploited through a $UMIDAS$ model to nowcast and forecast the YoY quarterly GDP growth rate. Hence, the CCLEI based on the Aruoba, Diebold, and Scotti (ADS) method is significantly able to predict three quarters in advance the YoY quarterly GDP growth rate, while its last two monthly observations should be exploited through an unrestricted $MIDAS$ model, confirming that the CCLEI is a reliable leading indicator of turning points in the economy of Cyprus. Importantly, the estimation of the single-variable $ADL - UMIDAS$ models using the components of the CCLEI, one at a time, shows that different high-frequency monthly lags should be considered depending on the CCLEI's component being included in the $UMIDAS$ model. Analytically, when the high-frequency monthly component is either the Brent Crude Oil Price, the Weighted ESI, or the Retail Trade Turnover Volume Index, three monthly high-frequency lags should be included in the $UMIDAS$ models, while when the high-frequency monthly component is either the Property Sales Contracts, Credit Cards Transactions, or the Temperature-Adjusted Volume Index of Electricity Production, only one monthly high-frequency lag should be included in the $UMIDAS$ model. Interestingly, when the high-frequency monthly component is Tourist Arrivals, the number of monthly lags to be included in the $UMIDAS$ model is ten. It is noteworthy to state that, the monthly performance and leading ability of the CCLEI will be studied over long periods to be evaluated accurately. To this extent, we will be producing and monitoring a diverse set of Cyprus Composite Leading Economic Indices, along with their components. The latest and most recent CCLEI (published on the 21st of November 2023) has the following scheme (Figure 4):

Figure 4: The CCLEI vis-à-vis the Economic Activity of Cyprus



Source: Economics Research Centre (CypERC) - Department of Economics, University of Cyprus (UCY).
Note that for comparison purposes, the Year-over-Year (YoY) quarterly growth rate of the Gross Domestic Product (GDP) vis-à-vis the YoY monthly growth rate of the CCLEI are presented in a standardized format in the graph. Shaded areas represent recession periods defined following the CERP Euro Area Business Cycle Dating Committee in combination with the conventional recession definition of at least two consecutive negative YoY quarterly GDP growth rates.

5.1. Forecasting the Cyprus GDP growth based on the CCLEI and its Leading Components

Subsequently, our analysis proceeded with forecasts for the economic outlook of Cyprus based on the best-fitted $ADL-UMIDAS$ models discussed in Section 5. Recall that, among the different estimated mixed-frequency UMIDAS models considering a maximum of four quarterly lags of the low-frequency YoY GDP growth and twelve monthly lags of the high-frequency YoY LEI growth, the $UMIDAS$ model considering two monthly lags of the high-frequency YoY CCLEI growth was chosen. Regarding the high-frequency leading components of the CCLEI, three monthly lags of the high-frequency YoY Brent Crude Oil Price, the Weighted ESI, and the Retail Trade Turnover Volume Index growth rates were selected, while only one monthly lag of the high-frequency Property Sales Contracts, Credit Cards Transactions, and the Temperature-Adjusted Volume Index of Electricity Production growth rates was selected. On the other hand, ten monthly lags of the high-frequency Tourist Arrivals growth rate were preferred. Table 2 reports the nowcasts for the fourth quarter of the GDP growth in 2023 (2023Q4) and the year 2023, as well as forecasts for the years 2024 and 2025 estimated from the best-fitted $ADL-UMIDAS$ models when considering the CCLEI as a predictor or a particular component of the CCLEI, and the projections arising from estimating the classical benchmark models – the Autoregressive (AR) and Random Walk (RW) models. It is noted that, for all the aforementioned best-fitted $UMIDAS$ and AR models, only one quarterly lag of the low-frequency GDP growth was chosen, indicating that only the information from the previous quarter is needed for accurate and reliable mixed- and common-frequency estimations. Interestingly, nowcasts for 2023Q4 and 2023, when considering forecast combinations (average approach) of the CCLEI's components are also indicated in Table 2 for comparison purposes with the forecasts provided by the CCLEI based on the ADS approach. The Root Mean Square Forecasting Error (RMSFE) computed for all the estimated $UMIDAS$, and the benchmark models is also provided for comparison purposes. In particular, the RMSFE is computed using as training sample the period 2001Q1-2012Q4 and as evaluation sample the period 2013Q1-2023Q4, where the relative training and evaluation sample periods are selected amid the Cyprus financial crisis and for the sample to be both in-sample and out-of-sample adequate. Last but not least, forecasts provided by major local and foreign organizations and institutions are also reported in Table 2.

Table 2: GDP Forecasts

GDP Forecasts based on the CCLEI and its Leading Components								
	2023Q1	**2023Q2**	**2023Q3**	**2023Q4f**	**2023f**	**2024f**	**2025f**	**RMSFE**
CCLEI	3.2	2.2	2.2	1.7	2.3	2.7	2.8	2.2455
OIL	3.2	2.2	2.2	3.0	2.6	3.0	3.4	2.7705
CYESI	3.2	2.2	2.2	1.2	2.2	2.5	2.7	2.6084
EAESI	3.2	2.2	2.2	2.2	2.5	2.6	2.6	3.1277
POL	3.2	2.2	2.2	2.5	2.5	3.0	2.9	2.5659
TOURA	3.2	2.2	2.2	2.7	2.6	2.7	2.7	6.6174
CARDS	3.2	2.2	2.2	2.3	2.5	2.6	2.6	3.6224
RETS	3.2	2.2	2.2	2.2	2.4	3.2	3.1	2.2490
ELECT	3.2	2.2	2.2	3.5	2.8	6.3	4.2	3.3476
CCLEI_avg	3.2	2.2	2.2	1.6	2.3	-	-	6.9111
AR(1)	3.2	2.2	2.2	2.3	2.5	2.6	2.7	3.4589
RW	3.2	2.2	2.2	2.8	2.6	2.8	2.8	5.3668
Forecasts published by Organizations and Institutions								
CypERC (01/11/2023)	3.2	2.2	-	-	2.4	2.8	-	-
CyStat (14/11/2023)	3.2	2.2	2.2	-	-	-	-	-
CBC (25/09/2023)	3.2	2.2	-	-	2.4	2.7	3.1	-
MoF (October 2023)	3.2	2.2	-	-	2.4	2.9	3.1	-
EC (15/11/2023)	3.2	2.2	-	-	2.2	2.6	2.9	-
IMF (October 2023)	3.2	2.2	-	-	2.2	2.7	-	-

Source: Economics Research Centre (CypERC) - Department of Economics, University of Cyprus (UCY).

The year-over-year quarterly GDP growth in Cyprus is nowcasted to slow from 2.2% in the third quarter of 2023 to 1.7% in the fourth quarter of 2023. Considering the predicted year-over-year quarterly GDP growth in Cyprus at 1.7% for the last quarter of the current year, the anticipated year-over-year quarterly GDP growth rate for the year 2023 is projected to climb to 2.3%, marking a remarkable decrease from the substantial increase of 5.1% observed in the previous year, 2022. Additionally, projections for the subsequent years, 2024 and 2025, indicate year-over-year quarterly growth rates of 2.7% and 2.8%, respectively. It is noted that the changes in the year-over-year quarterly Real GDP through the years 2023 to 2025 are influenced by various factors and, predominantly, by factors related to domestic demand. Analytically, private consumption which is expected to persist as a crucial driver of economic growth in the foreseeable future has surged significantly due to the ongoing robust increase in both employment and wages, while it is noteworthy to mention that the automatic partial adjustment of wages has served to mitigate to some extent the adverse effects of rising prices on consumption. Additionally, a substantial contribution is expected, primarily originating from ongoing large-scale private investments in residential and commercial construction and initiatives supporting digital and green development amid the implementation of the Cypriot Recovery and Resilience Plan, among other development-related plans.

On the other hand, the precarious external economic conditions, and the impact of ongoing war sanctions on the turnover of professional services are also among the most important factors affecting the growth prospects of the Cypriot economy. According to the September 2023 macroeconomic projections provided by the Central Bank of Cyprus, net exports are anticipated to harm the economic growth rate for the period 2023-2024. Specifically, the ongoing but decelerating expansion of the turnover of foreign companies, particularly those established in Cyprus in recent years and active in the technology sector, as well as the continual growth in tourism revenues, are counterbalanced by the adverse effects of sanctions resulting from the ongoing war on professional services turnover. Notably, the pace of growth in tourism and other export-driven services is anticipated to decelerate, reflecting a departure from the dynamic expansion observed in recent years and the fact that the tourism sector has successfully rebounded from the challenges posed by the pandemic crisis and the repercussions of the Russian war of aggression against Ukraine. This slowdown can, nonetheless, be attributed to the diminished growth momentum in Cyprus' trading partners as stated also in the latest macroeconomic forecast for Cyprus by the European Commission. The anticipated growth outlook for Cyprus is accompanied by both potential downsides and upsides. Notably, there has been a substantial increase in geopolitical uncertainty (Russian-Ukraine war and military conflicts in Israel), which could have ramifications for economic activity and prices in Cyprus in the upcoming quarters. The risks are sloping toward the downside, particularly due to Cyprus's significant reliance on oil imports and the susceptibility of crucial sectors such as construction, tourism, and trade to potential increases in interest rates.

Forecasts provided by other major local and foreign organizations and institutions also indicate a growth slowdown in 2023, followed by small improvements in the subsequent years, 2024 and 2025. More precisely, the YoY quarterly Cyprus GDP growth for 2023 is projected to be 2.4% by the Central Bank of Cyprus (CBC) and the Ministry of Finance (MoF), as well as according to the latest economic outlook issue released by the Economics Research Centre (CypERC) that focuses on an alternative methodology based on a large and diverse dataset and various econometric models. On the other hand, the European Commission (EC) and the International Monetary Fund (IMF) forecasts point to a year-over-year quarterly growth in Cyprus at 2.2%. Following the slowdown from 5.1% in 2022 to 2.3% in 2023, the YoY quarterly GDP growth is expected to pick up in the following 2024 and 2025 years reaching a growth of 2.7% and 2.8%, respectively, according to the $ADL - UMIDAS$ model with the CCLEI as a predictor. Similarly, according to the projections provided by the local and foreign economic organizations and institutions reported in Table 2, the Cyprus economic outlook is expected to rise in 2024 and 2025. Analytically, the YoY quarterly GDP growth is expected to be equal to 2.8% based on the latest economic outlook issue released by the Economics Research Centre (CypERC), 2.7% according to the Central Bank of Cyprus (CBC) and the International Monetary Fund (IMF), 2.9% according to the Ministry of Finance (MoF), and 2.6% as indicated by the European Commission (EC). Finally, for 2025 the Central Bank of Cyprus (CBC) and the Ministry of Finance (MoF) point to a growth of 3.1%, while the European Commission (EC) indicates a growth, closer

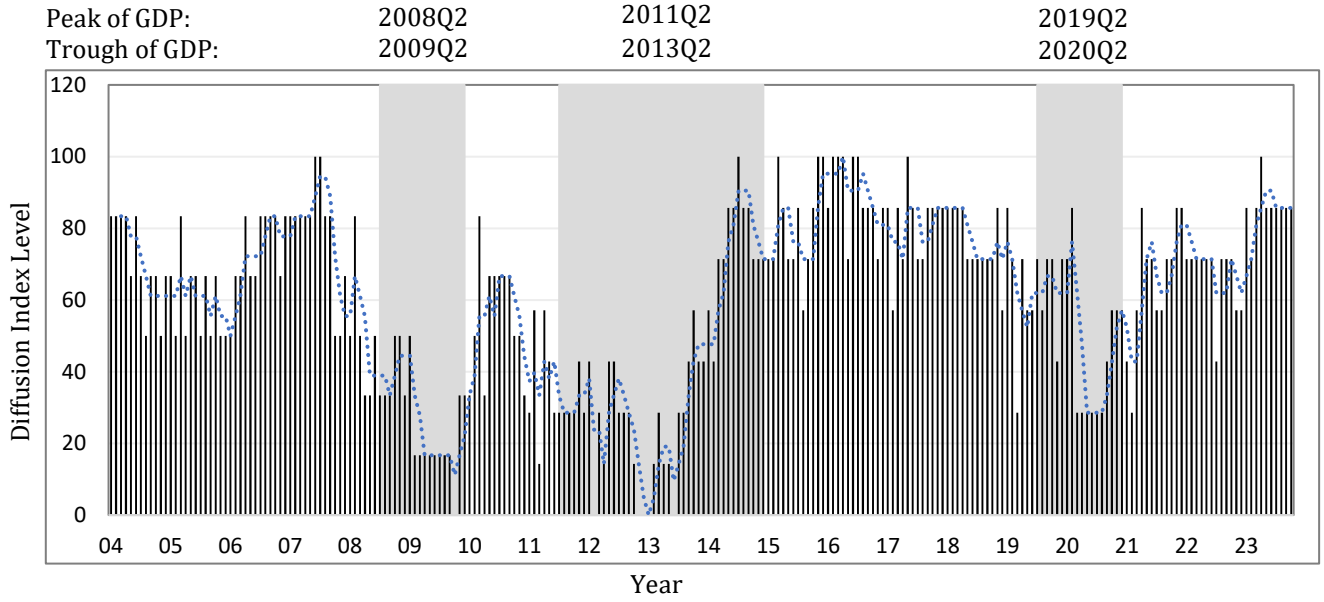
to our projection, of 2.9%. Crucially, our projections based on the $ADL - UMIDAS$ model with the CCLEI as a predictor for the last quarter of 2023, the current year, and the subsequent two years, 2024 and 2025, are reliable and accurate when compared to the projections provided by the individual leading components of the CCLEI, the forecast averaging approach based on the CCLEI's leading components, as well as compared to the classical AR and RW benchmark models. More precisely, assessing the forecasts provided by the alternative predictors and models, it can be clearly seen that the RMSFE of the $ADL - UMIDAS$ model with the CCLEI as a predictor is the lowest error arising vis-à-vis the errors that arise when estimating either the single-variable $ADL - UMIDAS$ model with alternative predictors, the model based on forecast averaging techniques, or the commonly used in the literature AR and RW benchmark models. For instance, the RMSFE is estimated to be 2.2455 when the $ADL - UMIDAS$ model with the CCLEI predictor is considered, whereas it is equal to 2.7707, 6.9111, and 3.4589 when the $ADL - UMIDAS$ model with the OIL predictor, the forecast average approach, and the AR model are estimated, respectively.

5.2. Turning Points based on Individual Components of the CCLEI

Turning points determine the time at which the economy turns from recession to recovery or from growth to recession. Many tools have been developed for computing the turning points in economic activity, such as the *Diffusion Indices* (e.g. Stock and Watson (1998, 2002)) which measure the proportion of the component series that contribute positively to the index. In particular, Stock and Watson used a large number of estimated predictors for the forecasting of macroeconomic time series, where the predictors were constructed using a small number of indexes by Principal Component Analysis (PCA). The approximate Dynamic Factor Model (DFM) for the estimation of the indexes and construction of the forecasts was based on the Diffusion Indexes developed by the NBER business cycle framework for measuring the co-movement in a set of macroeconomic variables. Following the Conference Board (CB) methodology (BCI Handbook (2001)), a rise of more than 0.05% in the components, a change of less than 0.05%, and a drop of more than 0.05% attributes to the components a value of 1, 0.5, and 0, respectively. The corresponding year-over-year monthly changes are changes calculated by comparing months with the same months of the previous year. The components of our constructed Composite Leading Economic Index (CCLEI) contribute all positively to the GDP growth rate except for the Brent Crude Oil Price series and thus opposite values are assigned to the oil series. Thereby, a value of "1" is assigned to the oil series within the computation of the Diffusion Index instead of "0" when the oil price declines for a specific month. As a final step, the Diffusion Index is computed as the average of the values of the CCLEI's components for each month, multiplied by the number 100.

The Diffusion index complements the turning points methodology by focusing on the behaviour of the individual components/indicators that comprise the CCLEI. Following the Diffusion Index methodology, if the index is above 50, then this is a sign that the economy is probably expanding, or at least moving in that direction and if the index is below 50, then this suggests that the economy is probably in a recession, or at least moving in that direction. The Diffusion Index calculated based on Year-over-Year (YoY) monthly changes of the components of the CCLEI, reached a peak (100) in June 2007 (i.e. all components exhibited positive YoY monthly changes) and then started decreasing sharply signalling downward pressures of economic growth and thus portending the beginning of the Global Financial Crisis of 2008-2009. On the other hand, after it dropped to its lowest value in October 2009, it started rising gradually indicating that the economy would emerge from the crisis soon (see Figure 5). Similar conclusions can be derived from the financial crisis that started in July 2011, as well as the recent economic crisis that occurred in the midst of the international coronavirus pandemic. These results show that the Diffusion Index computed based on YoY monthly changes of the components of our CCLEI can consistently determine turning points in the economy and thus prove the good historical performance of the components chosen to comprise our leading index in identifying business cycle chronologies and recessions. Figure 5 represents the relevant Diffusion Index constructed based on changes in the CCLEI's components, along with its three-month moving average.

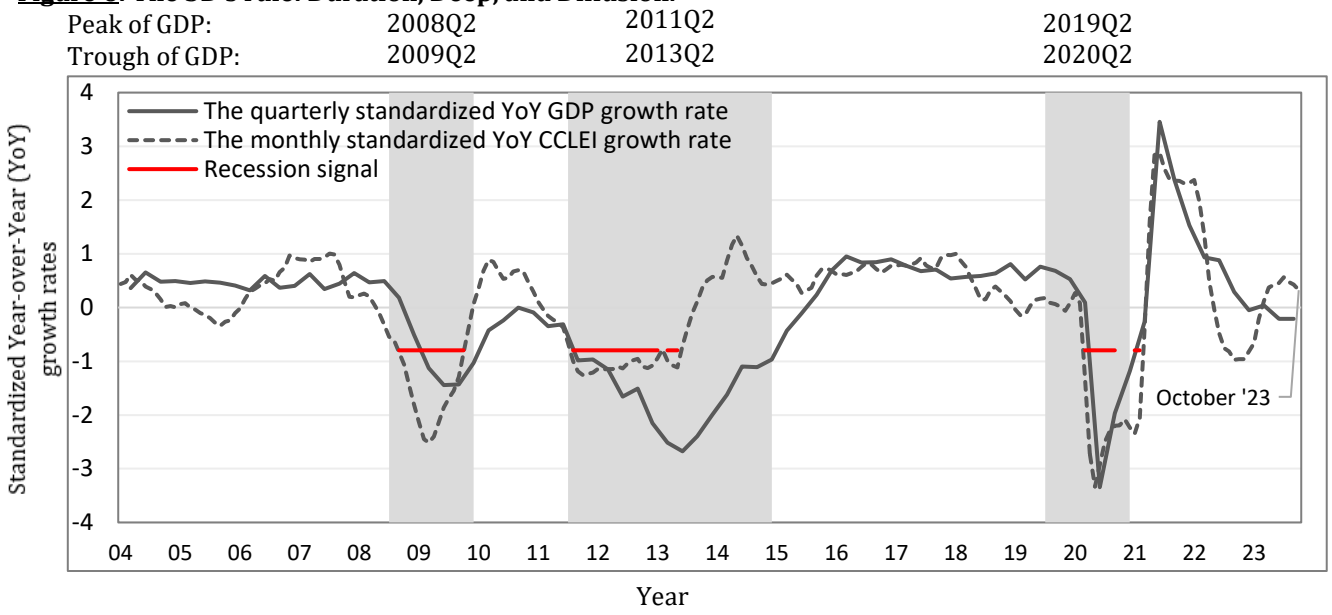
Figure 5: The Diffusion Index Level based on the CCLEI's components.



Source: Economics Research Centre (CypERC) - Department of Economics, University of Cyprus (UCY).
Shaded areas represent recession periods defined following the CERP Euro Area Business Cycle Dating Committee in combination with the conventional recession definition of at least two consecutive negative YoY quarterly GDP growth rates.

In the subsequent stage, the Diffusion Index estimated based on changes in the CCLEI's components is used for the implementation of the so-called 3D's rule to evaluate a downward development of the CCLEI. Following the corresponding analysis provided by the Conference Board (CB), the Duration, Depth, and Diffusion – the 3D's rule of the downward movements in the CCLEI is construed. According to the Conference Board (CB) methodology, the Duration and Depth of a CCLEI's descending headway are measured by the rate of change of the CCLEI over the last six months, while Diffusion is measured following the earlier discussed analysis. Thenceforth, the underlying 3D's rule indicates signals of imminent recessions when the estimated Diffusion Index drops below the threshold of 50, while at the same time, the decline in the CCLEI over the most recent six months falls below a specific threshold value (measured by the median of the negative year-over-year monthly changes in the CCLEI). When these two criteria meet simultaneously, the 3D's rule points to a forthcoming turn in economic activity and in particular, to an impending recession, as represented in Figure 6. More specifically, the following graph (Figure 6) represents the YoY quarterly GDP growth rate vis-à-vis the YoY monthly CCLEI growth rate (in their standardized form) and the relative line (red line) that meets at the same time the two criteria (drawn at the threshold value), signaling a potential upcoming recession. Note that, instead of estimating declines over the latest six months (like the CB approach does), declines starting from 2000 until the latest and most recent period where the CCLEI is estimated (November 2023) are considered with the threshold value being computed as the median over all the declines occurred for the CCLEI since 2000. This allows us to assess the accuracy of the CCLEI and its components in signalling potential recessions, beyond their ability to predict turning points in economic activity. Beyond doubt, the 3D's rule based on duration, depth, and diffusion of decelerating movements in the CCLEI, shows that the CCLEI and its components have been reliable predictors of impending recessions, accurately foreseeing the three recession periods incurred in Cyprus since 2000 as a result of the Global Financial Crisis, the Cyprus Financial Crisis, and the Wealth and Health Crisis amid the COVID-19 pandemic. As for the latest and recent deceleration in both the Cyprus economic activity and the CCLEI growth, the 3D's rule might not point to a forthcoming recession period, but the economy is, nevertheless, extremely exposed to a highly uncertain geopolitical environment that prevails globally, and inevitably does not let the economy of Cyprus unaffected.

Figure 6: The 3D's rule: Duration, Deep, and Diffusion.



Source: Economics Research Centre (CypERC) - Department of Economics, University of Cyprus (UCY).
Note that for comparison purposes, the Year-over-Year (YoY) quarterly growth rate of the Gross Domestic Product (GDP) vis-à-vis the YoY monthly growth rate of the CCLEI are presented in a standardized format in the graph. Shaded areas represent recession periods defined following the CERP Euro Area Business Cycle Dating Committee in combination with the conventional recession definition of at least two consecutive negative YoY quarterly GDP growth rates, while the red line provides a recession signal following the methodology applied by the Conference Board (CB).

6. Summary

The global economic crisis and the worldwide outbreak of the coronavirus pandemic, as well as the uncertainty that continues to unfold globally, have rejuvenated the interest in analyzing business cycles and predicting their turning points. Beyond the recent COVID-19 pandemic, geopolitical events such as Russia's aggressive incursion into Ukraine since February 2022 and the ongoing military conflicts in Israel since October 7, 2023, have intensified global unrest. These developments have exacerbated the already strained international geopolitical landscape, exerting adverse effects on the global economy. In light of these circumstances, the present study establishes a monthly Composite Leading Economic Index for the Cyprus economy (CCLEI) to provide early warning signals for the turning points of economic activity in Cyprus on a monthly basis. The CCLEI is constructed based on a model-based approach proposed by Aruoba, Diebold, and Scotti (ADS) in 2009, which has been also used for estimating the U.S. Business Conditions Index on a regular basis by the Philadelphia Federal Reserve Bank. The leading indicators comprising the CCLEI are selected from an extensive range of domestic and international economic sectors and practices and provide a strong and stable leading correlation for the GDP in Cyprus following several statistical tests. The leading components of the CCLEI which are evaluated regularly are the Brent Crude Oil prices, the Weighted Economic Sentiment Indicator in Cyprus and the Euro Area, Total Property Sales of Contracts, Number of Tourist Arrivals, the Value of Credit Card Transactions, the Retail Trade Sales Turnover Volume Index, and the Temperature-Adjusted Volume Index of Electricity Production. Notably, the consequences of the global uncertain environment predominating amidst the COVID-19 pandemic and the Russia-Ukraine war, among other uncertainty-causing events, are visible on several of the leading components of the CCLEI: zero tourist arrivals, highest uncertainty level, and highest oil price are some of the results of those unexpected events. Importantly, mixed-frequencies are enhanced in our analysis by encompassing monthly data frequency for all the components of the CCLEI, weekly data frequency for the Brent Crude oil price, useful bi-weekly frequency information for tourist arrivals, and daily frequency information for electricity production. Substantially, our analysis shows that comparing the growth rates of the electricity load – unadjusted with the growth rates of the electricity load adjusted with temperature, weather fluctuations indeed affect to a great extent the electricity load imposing the significance of taking into consideration climate crisis and its consequences on economic growth.

An appraisal of the statistical relationship between the CCLEI and the Cyprus GDP shows that the CCLEI based on the ADS approach has a significant predictive ability of three quarters with respect to the upcoming performance of the economic activity in Cyprus, while exploiting the higher frequency of the CCLEI and in particular its last two most recent observations through mixed-frequency models, valuable information arises for nowcasting and forecasting purposes. In addition, the estimation of the single-variable Autoregressive Distributed Lag Unrestricted MIxed DAta Sampling ($ADL - UMIDAS$) models using the components of the CCLEI, one at a time, shows that different high-frequency monthly lags should be considered depending on the CCLEI's component being included in the unrestricted $MIDAS$ model. Considering the best-fitted models arising from our estimations, nowcasts and forecasts for the last quarter of 2023, the current year, 2023, and the subsequent years, 2024 and 2025, are conducted showing a deceleration in Cyprus' economic activity in 2023 compared to 2022, before starting to pick up in the following years 2024 and 2025. In more detail, the year-over-year quarterly GDP growth in Cyprus is nowcasted to slow from 2.2% in the third quarter of 2023 to 1.7% in the fourth quarter of 2023, while the anticipated year-over-year quarterly GDP growth rate for the year 2023 is projected to climb to 2.3%, marking a remarkable decrease from the substantial increase of 5.1% observed in the previous year, 2022. Additionally, projections for the subsequent years, 2024 and 2025, indicate year-over-year quarterly growth rates of 2.7% and 2.8%, respectively. Our projections for the current and the two subsequent years align with forecasts provided by other major local and foreign organizations and institutions that also indicate a growth slowdown in 2023, followed by small improvements in the subsequent years, 2024 and 2025. Furthermore, the Diffusion Index computed based on the components of the CCLEI shows that the components comprising the CCLEI can consistently determine turning points in the economy and thus prove their good historical performance in identifying business cycle chronologies and recessions. Substantially, following the implementation of the 3D's rule (Duration, Depth, Diffusion), the CCLEI and its components have proven to be reliable predictors of impending recessions, accurately anticipating recession periods that have incurred in the economy of Cyprus since 2000, including the Global Financial Crisis, the Cyprus Financial Crisis, and the recent global Wealth and Health Crisis amid the coronavirus pandemic. Regarding the recent slowdown in both the economic activity of Cyprus and the growth of the Composite Leading Economic Index (CCLEI), it is noteworthy that the 3D's rule does not necessarily indicate an impending recession. However, it is crucial to acknowledge that the economy of Cyprus is significantly vulnerable to the prevailing uncertain geopolitical environment worldwide, which inevitably has repercussions on Cyprus's economic conditions.

Concluding, the CCLEI is a reliable leading index of turning points in the Cypriot economy. The monthly performance of the CCLEI will, nevertheless, be monitored and updated regularly as well as its leading components. The monthly bulletin of the CCLEI has been published since the 12th of December 2019, in which the index and its flash estimate are re-estimated providing timely information of the economic activity cycles in Cyprus. All monthly bulletins along with the report can be found at the Economics Research Centre (CypERC) official website: Cyprus Composite Leading Economic Index (CCLEI) - Economics Research Centre (CypERC) (ucy.ac.cy), where the corresponding release calendar of the CCLEI so far is as follows:

2019			
Thursday, December 12, 2019	For October 2019	Published	✓
2020			
Monday, January 20, 2020	For November 2019	Published	✓
Tuesday, February 04, 2020	For December 2019	Published	✓
Friday, February 28, 2020	For January 2020	Published	✓
Tuesday, March 31, 2020	For February 2020	Published	✓
Thursday, April 30, 2020	For March 2020	Published	✓
Monday, June 01, 2020	For April 2020	Published	✓
Wednesday, July 01, 2020	For May 2020	Published	✓
Monday, August 03, 2020	For June 2020	Published	✓
Tuesday, September 01, 2020	For July 2020	Published	✓

Wednesday, September 30, 2020	For August 2020	Published	✓
Monday, November 02, 2020	For September 2020	Published	✓
Tuesday, December 01, 2020	For October 2020	Published	✓
2021			
Monday, January 11, 2021	For November & December 2020	Published	✓
Monday, February 08, 2021	For January 2021	Published	✓
Thursday, March 11, 2021	For February 2021	Published	✓
Monday, April 12, 2021	For March 2021	Published	✓
Monday, May 17, 2021	For April 2021	Published	✓
Friday, June 18, 2021	For May 2021	Published	✓
Friday, July 16, 2021	For June 2021	Published	✓
Monday, August 16, 2021	For July 2021	Published	✓
Tuesday, September 28, 2021	For August 2021	Published	✓
Wednesday, October 20, 2021	For September 2021	Published	✓
Friday, November 12, 2021	For October 2021	Published	✓
Monday, December 20, 2021	For November 2021	Published	✓
2022			
Tuesday, January 18, 2022	For December 2021	Published	✓
Thursday, February 17, 2022	For January 2022	Published	✓
Thursday, March 17, 2022	For February 2022	Published	✓
Thursday, April 14, 2022	For March 2022	Published	✓
Wednesday, May 18, 2022	For April 2022	Published	✓
Tuesday, June 14, 2022	For May 2022	Published	✓
Friday, July 15, 2022	For June 2022	Published	✓
Monday, August 22, 2022	For July 2022	Published	✓
Tuesday, September 13, 2022	For August 2022	Published	✓
Thursday, October 13, 2022	For September 2022	Published	✓
Friday, November 11, 2022	For October 2022	Published	✓
Tuesday, December 13, 2022	For November 2022	Published	✓
2023			
Wednesday, January 18, 2023	For December 2022	Published	✓
Friday, February 17, 2023	For January 2023	Published	✓
Wednesday, March 22, 2023	For February 2023	Published	✓
Thursday, April 20, 2023	For March 2023	Published	✓
Wednesday, May 24, 2023	For April 2023	Published	✓
Friday, June 16, 2023	For May 2023	Published	✓
Tuesday, July 18, 2023	For June 2023	Published	✓
Wednesday, September 6, 2023	For August 2023	Published	✓
Thursday, October 19, 2023	For September 2023	Published	✓
Tuesday, November 21, 2023	For October 2023	Published	✓
Wednesday, December 27, 2023	For November 2023	Preliminary	

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9. Appendix: Description of Economic Leading Indicators

	Frequency	Acronym	Description	Data Source
Category 1: Housing and Building				
1	Monthly	BUILD	Number of Authorized Building Permits	CyStat
2	Monthly	BUILD (€000's)	Value of Authorized Building Permits	CyStat
3	Monthly	BUILD (area m2)	Area of Authorized Building Permits	CyStat
4	Monthly	POL	Total Sales of Contracts	Cyprus Department of lands and surveys (CDLS)
5	Monthly	POL_buyers	Sales Contracts (Foreigners) Number of buyers	CDLS
6	Monthly	POL_foreign	Sales Contracts (Foreigners) Pancyprian	CDLS
7	Monthly	POL_local	Sales Contracts (Locals) Pancyprian	Formula
8	Monthly	POL_EU	Sales Contracts Aggregate Pancyprian EU	CDLS
9	Monthly	POL_nonEU	Sales Contracts Aggregate Pancyprian non-EU	CDLS
10	Monthly	CEM	Total Local Sales of Cement	CyStat
11	Quarterly	HOUS	Residential Property Price Index	Central Bank of Cyprus (CBC)
Category 2: Energy and Production				
1	Monthly	PETROL	Total sales of Petroleum Products	Cystat
2	Monthly	ELECT	Volume Index of Electricity Production	Cystat
3	Monthly	MANUF	Volume Index of Manufacturing Production	Cystat
4	Monthly	IP	Volume Index of Industrial Production	Cystat
5	Monthly	MANUF_turn	Manufacturing Turnover Index	Eurostat
6	Monthly	IP_turn	Industrial Turnover Index	Eurostat
7	Monthly	ELECT_prices	Electricity Output Prices Index	Eurostat
8	Monthly	MANUF_prices	Manufacturing Output Prices Index	Eurostat
9	Monthly	IP_prices	Industrial Output Prices Index	Eurostat
Category 3: Tourists				
1	Monthly	TOURA	Tourists' Arrivals	Cystat
2	Monthly	TOURR	Tourists' Revenues	Cystat
Category 4: Consumption and Trade				
1	Monthly	MOTOR	Registration of Motor Vehicles	Cystat
2	Monthly	SALOON	Registration of Passenger Saloon Cars	Cystat
3	Monthly	CARDS	Value of Visa Card Transactions of Cypriots in Cyprus	JCC
4	Monthly	abroadcardsvalue	Value of Visa Card Transactions of Cypriots abroad	JCC
5	Monthly	touristcardsvalue	Value of Visa Card Transactions of Tourists in Cyprus	JCC
6	Monthly	RETS_value	Retail Trade, except of motor vehicles turnover value index	Cystat
7	Monthly	RETS	Retail Trade, except of motor vehicles turnover volume index	Cystat
8	Monthly	importeur	Total Imports for home consumption	Cystat
9	Monthly	exporteur	Domestic Exports	Cystat
10	Quarterly	VAT	VAT Receivable	CyStat

Category 5: Loans and new companies				
1	Monthly	loanres	Loans to non-MFIs (outstanding amounts), domestic residents	CBC
2	Monthly	loantotal	Loans to non-MFIs (outstanding amounts), total	CBC
3	Monthly	depres	Deposits of non-MFIs held with MFIs (outstanding amounts), domestic residents	CBC
4	Monthly	deptotal	Deposits of non-MFIs held with MFIs (outstanding amounts), total	CBC
5	Monthly	depggov	Deposits of non-MFIs held with MFIs (outstanding amounts), general government	CBC
6	Monthly	loanggov	Loans to non-MFIs (outstanding amounts), general government	CBC
7	Monthly	loancorp	Loans to non-MFIs (outstanding amounts), Non-financial corporations	CBC
8	Monthly	loanconcr	Loans to non-MFIs (outstanding amounts), households	CBC
9	Monthly	loanhous	Loans to non-MFIs (outstanding amounts), households-housing loans	CBC
10	Monthly	COMP	Registration of New Companies	Department of the Registrar of Companies and Official Receiver of the Republic of Cyprus
Category 6: Main Cyprus Indicators (ESI; EEI; confidence indicators)				
1	Monthly	CYINDU	Cyprus Industry Confidence Indicator	European Commission (ECFIN)
2	Monthly	CYSERV	Cyprus Services Confidence Indicator	ECFIN
3	Monthly	CYCONS	Cyprus Consumption Confidence Indicator	ECFIN
4	Monthly	CYRETS	Cyprus Retails Confidence Indicator	ECFIN
5	Monthly	CYBUILD	Cyprus Building Confidence Indicator	ECFIN
6	Monthly	CYESI	Cyprus Economic Sentiment Indicator	ECFIN
7	Monthly	CYEEI	Cyprus Employment Expectations Indicator	ECFIN
Category 7: Cyprus Industry Survey Indicators				
1	Monthly	INDU.CY.TOT.1.BS.M	Cyprus Production trend observed in recent months	ECFIN
2	Monthly	INDU.CY.TOT.2.BS.M	Cyprus Assessment of order-book levels	ECFIN
3	Monthly	INDU.CY.TOT.3.BS.M	Cyprus Assessment of export order-book levels	ECFIN
4	Monthly	INDU.CY.TOT.4.BS.M	Cyprus Assessment of stocks of finished products	ECFIN
5	Monthly	INDU.CY.TOT.5.BS.M	Cyprus Production expectations for the months ahead	ECFIN
6	Monthly	INDU.CY.TOT.6.BS.M	Cyprus Selling price expectations for the months ahead	ECFIN
7	Monthly	INDU.CY.TOT.7.BS.M	Cyprus Employment expectations for the months ahead	ECFIN
Category 8: Cyprus Services Survey Indicators				
1	Monthly	SERV.CY.TOT.1.BS.M	Cyprus Business situation development over the past 3 months	ECFIN
2	Monthly	SERV.CY.TOT.2.BS.M	Cyprus Evolution of the demand over the past 3 months	ECFIN
3	Monthly	SERV.CY.TOT.3.BS.M	Cyprus Expectation of the demand over the next 3 months	ECFIN
4	Monthly	SERV.CY.TOT.4.BS.M	Cyprus Evolution of the employment over the past 3 months	ECFIN
5	Monthly	SERV.CY.TOT.5.BS.M	Cyprus Expectations of the employment over the next 3 months	ECFIN
6	Monthly	SERV.CY.TOT.6.BS.M	Cyprus Expectations of the prices over the next 3 months	ECFIN
Category 9: Cyprus Consumption Survey Indicators				
1	Monthly	CONS.CY.TOT.1.BS.M	Cyprus Financial situation over last 12 months	ECFIN
2	Monthly	CONS.CY.TOT.2.BS.M	Cyprus Financial situation over next 12 months	ECFIN
3	Monthly	CONS.CY.TOT.3.BS.M	Cyprus General economic situation over last 12 months	ECFIN
4	Monthly	CONS.CY.TOT.4.BS.M	Cyprus General economic situation over next 12 months	ECFIN
5	Monthly	CONS.CY.TOT.5.BS.M	Cyprus Price trends over last 12 months	ECFIN
6	Monthly	CONS.CY.TOT.6.BS.M	Cyprus Price trends over next 12 months	ECFIN
7	Monthly	CONS.CY.TOT.7.BS.M	Cyprus Unemployment expectations over next 12 months	ECFIN
8	Monthly	CONS.CY.TOT.8.BS.M	Cyprus Major purchases at present	ECFIN
9	Monthly	CONS.CY.TOT.9.BS.M	Cyprus Major purchases over next 12 months	ECFIN

10	Monthly	CONS.CY.TOT.10.BS.M	Cyprus Savings at present	ECFIN
11	Monthly	CONS.CY.TOT.11.BS.M	Cyprus Savings over next 12 months	ECFIN
12	Monthly	CONS.CY.TOT.12.BS.M	Cyprus Statement on financial situation of household	ECFIN
			Category 10: Cyprus Retail trade Survey Indicators	
1	Monthly	RETA.CY.TOT.1.BS.M	Cyprus Business activity (sales) development over the past 3 months	ECFIN
2	Monthly	RETA.CY.TOT.2.BS.M	Cyprus Volume of stock currently hold	ECFIN
3	Monthly	RETA.CY.TOT.3.BS.M	Cyprus Orders expectations over the next 3 months	ECFIN
4	Monthly	RETA.CY.TOT.4.BS.M	Cyprus Business activity expectations over the next 3 months	ECFIN
5	Monthly	RETA.CY.TOT.5.BS.M	Cyprus Employment expectations over the next 3 months	ECFIN
6	Monthly	RETA.CY.TOT.6.BS.M	Cyprus Prices expectations over the next 3 months	ECFIN
			Category 11: Cyprus Construction Survey Indicators	
1	Monthly	BUIL.CY.TOT.1.BS.M	Cyprus Building activity development over the past 3 months	ECFIN
2	Monthly	BUIL.CY.TOT.3.BS.M	Cyprus Evolution of your current overall order books	ECFIN
3	Monthly	BUIL.CY.TOT.4.BS.M	Cyprus Employment expectations over the next 3 months	ECFIN
4	Monthly	BUIL.CY.TOT.5.BS.M	Cyprus Prices expectations over the next 3 months	ECFIN
			Category 12: Foreign Economic and Sentiment Indicators	
1	Weekly	OIL	Brent Crude Oil (€) - Commodity Prices	Global Financial Data
2	Monthly	EAESI	Euro Area Economic Sentiment Indicator	ECFIN
3	Monthly	EAEEI	Euro Area Employment Expectations Indicator	ECFIN
4	Monthly	EUESI	European Union Economic Sentiment Indicator	ECFIN
5	Monthly	EUEEI	European Union Employment Expectations Indicator	ECFIN
6	Monthly	BCI	Euro area Business Climate Indicator	ECFIN
7	Monthly	UKESI	United Kingdom Economic Sentiment Indicator	ECFIN
8	Monthly	UKEEI	United Kingdom Employment Expectations Indicator	ECFIN
9	Monthly	EA_HCPI	EA Harmonised Consumer Price Index	Eurostat
10	Monthly	EASTOXX50	Euro area, Euro, Dow Jones Euro Stoxx 50 Price Index	ECB
11	Monthly	EASTOXX	Euro area, Euro, Dow Jones Euro Stoxx Price Index	ECB
			Category 13: Exchange Rates against Euro	
1	Monthly	fxyeneur	YENEUR exchange rates against the euro	Eurostat
2	Monthly	fxusdeur	USEUR exchange rates against the euro	Eurostat
3	Monthly	fxgbpeur	UKEUR exchange rates against the euro	Eurostat
4	Monthly	fxchfeur	SWEUR exchange rates against the euro	Eurostat
5	Monthly	fxcadeur	CANEUR exchange rates against the euro	Eurostat
6	Monthly	fxrubeur	RUBEUR exchange rates against the euro	Eurostat
			Category 14: Cyprus Stock Exchange (CSE)	
1	Monthly	CSE	CSE All Share Composite	XAK
2	Monthly	FTSE/SE-20	FTSE/SE-20	XAK
3	Monthly	SE_HOTELS	SE Hotels Index	XAK
4	Monthly	SE_INVEST	SE Investment Companies	XAK
			Category 15: Cyprus Macroeconomic Indicators	
1	Monthly	MaaCY	Maastricht Cyprus (EMU convergence criterion)	Eurostat
2	Monthly	CY_HCPI	Harmonized Consumer Price Index	Eurostat
3	Monthly	CY_CPI	CPI Cyprus	Cystat
4	Monthly	CY_CPI_elect	CPI-Housing water electricity and gas	Cystat
5	Monthly	UNEMP	Total Registered Unemployed (act number)	Cystat
6	Monthly	UnmRatCY	Cyprus Unemployment Rate	Eurostat
7	Quarterly	EMP_nu	Total Number of People Employed	CyStat
8	Quarterly	EMP_hours	Total hours worked	CyStat
9	Quarterly	GDP	Gross Domestic Product	CyStat