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Identification and real-time forecasting of Norwegian business cycles

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ABSTRACT

We define and forecast classical business cycle turning points for the Norwegian economy. When defining reference business cycles, we compare a univariate and a multivariate Bry–Boschan approach with univariate Markov-switching models and Markov-switching factor models. On the basis of a receiver operating characteristic curve methodology and a comparison of the business cycle turning points of Norway's main trading partners, we find that a Markov-switching factor model provides the most reasonable definition of Norwegian business cycles for the sample 1978Q1–2011Q4. In a real-time out-of-sample forecasting exercise, focusing on the last recession, we show that univariate Markov-switching models applied to surveys and a financial conditions index are timely and accurate in calling the last peak in real time. However, the models are less accurate and timely in calling the trough in real time.

1. Introduction

Short-term analyses in central banks and other policy institutions are intended to provide policy makers, and possibly larger audiences, with assessments of the recent past and current business cycle. There is a long tradition in business cycle analysis of separating periods of contraction from periods of expansion (see Schumpeter, 1954). Policy decisions vary depending on whether the economy is in an expansionary or a recessionary period. Most of the research to date has focused on US data, where the cycle defined by the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER) cycle is regarded as the official reference cycle.

There is no authoritative dating of classical business cycles for the Norwegian economy. Norway is characterized by being a small open economy with large exports of energy (gas and oil) goods, and it is not obvious whether Norwegian business cycles are synchronized fully with the cycles of other Scandinavian countries, or with the European or US cycles.

The contributions of this paper are twofold. First, we define classical business cycle turning points for the Norwegian economy for the period 1978Q1–2011Q4, exploring a widely used set of methods. Second, in a real-time out-of-sample forecasting exercise, we study the timeliness and accuracy of the different methods in order to predict the peak and trough of the last recession.

To define reference business cycles for the Norwegian economy, we estimate and compare cycles from various univariate and multivariate approaches. In particular, we consider a univariate Bry–Boschan (BB) approach (see Bry & Boschan, 1971; Harding & Pagan, 2002) and a univariate Markov-switching (MS) model (see Hamilton, 1989). We

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apply these methods to the GDP for mainland Norway, and label the results BB-GDP and MS-GDP, respectively. For multivariate methods, we consider a quarterly Markov-switching dynamic factor model (MS-FMQ; see Chauvet, 1998; Chauvet & Piger, 2008), and also apply the BB rule to a coincident index constructed by an inverse standard deviation weighting (BB-ISD; see Stock & Watson, 2014).

We begin by comparing dating, duration and amplitude measures of the Norwegian business cycles provided by the various methods to business cycles for the US (obtained from NBER), for the euro area (obtained from the Center for European Policy Research's (CEPR) Euro Area Business Cycle Dating Committee (EABCDN) and for the UK and Sweden (obtained from Economic Cycle Research Institute (ECRI)). Most of the peaks and troughs in the Norwegian economy are related to peaks and troughs in other countries. In particular, business cycles in Norway seem to be related more closely to US business cycles than to business cycles in the euro area, Sweden and the UK, in terms of dating as well as duration and amplitude.

To the best of our knowledge, only two earlier studies have aimed to date classical turning points in the Norwegian economy. Christoffersen (2000) defined classical business cycles in the Nordic countries by using the BB algorithm on the monthly index of manufacturing production from 1960 to 1998. A more recent study by Fushing, Chen, Berge, and Jordà (2010) utilized non-parametric coding on the basis of three variables: quarterly GDP, quarterly employment and monthly industrial production. While we find that the four methods that we use share some similarities with the peak and trough dates of Christoffersen (2000) and Fushing et al. (2010), there are also clear differences.

Berge and Jordà (2011) introduced the receiver operating characteristic (ROC) curve methodology for classifying economic activity in the US as recessions and expansions. We perform a similar analysis applied to the four methods described above. On the basis of the international comparison, results from other studies of Norwegian cycles, and the ROC curve analysis, we select the cycle identified by the MS-FMQ approach as our reference cycle.

We then turn to the prediction of business cycle peaks and troughs in real time. As was emphasized by Hamilton (2011), this is a challenging task due to factors such as data revisions, time-lagging data availability and changes in economic relationships over time. While Harding and Pagan (2003) found that the BB approach was preferable to MS models when defining business cycles ex post for the US economy, Chauvet and Piger (2008) showed that a Markov switching dynamic factor model was superior for detecting business cycles in real time.

Several papers have documented that surveys and financial data are useful for predicting macro variables (see e.g. Hansson, Jansson, & Löf, 2005, Abberger, 2007, and Claveria, Pons, & Ramos, 2007, for applications using survey data; and Estrella & Mishkin, 1998, and Stock & Watson, 2003, for applications to financial data[1]). As was highlighted by Evans (2005), Giannone, Reichlin, and Small (2008), and Aastveit, Gerdrup, Jore, and Thorsrud (2014), for example, one advantage of surveys and financial market data is that they are available in a timely manner and not revised much.

Motivated by these studies, we also consider univariate MS models applied to three different quarterly surveys and a monthly financial condition index (FCI). When using the BB approach, predictions are required in order to forecast turning points in real time. We suggest the use of bivariate VAR models with the GDP for mainland Norway, together with either one of the surveys or the FCI, and call a recession whenever the forecasted values of GDP imply a peak.

Focusing on the last recession, we show that the univariate MS models that use survey data and the FCI accurately call the peak in 2008Q2. The univariate MS models that use the FCI and the consumer confidence survey detect this turning point at the start of August 2008 and the start of December 2008, respectively, i.e., about one and five months after the peak quarter. In comparison, the quarterly MS-FMQ calls the same peak in mid-February 2009. It should be noted that the BB rule applied to the bivariate VAR models that include GDP and a survey or FCI is about one quarter later in terms of calling the peak quarter. Importantly, these models also call the peak in 2008Q3, i.e., one quarter after the peak provided by the ex-post reference cycle. Finally, all of the models find it more challenging to predict the trough in 2009Q3. The majority of the models detect the trough quarter to be 2009Q1, two quarters earlier than in the reference cycle.

Our paper is related to a vast number of papers that estimate and predict business cycle turning points. See for example Anas, Billio, Ferrara, and Mazzi (2008), Darné and Ferrara (2011) and Billio, Casarin, Ravazzolo, and van Dijk (2012) for applications to the Euro area; and Chauvet (1998), Chauvet and Piger (2008), Harding and Pagan (2002, 2006), Hamilton (2011) and Stock and Watson (2014) for applications to the US.

The rest of the paper is organized as follows: the next section describes the modeling framework and discusses the definition of business cycle turning points. Section 3 presents data and the dating of business cycles in Norway over the past four decades. Section 4 focuses on the prediction of turning points in real time, describes the recursive forecasting exercise, and presents the results. Section 5 concludes.

2. Business cycle dating approaches

Following Burns and Mitchell (1946), we define business cycles as fluctuations in aggregate economic activity. This is the classical business cycle, characterized by peaks and troughs and describing developments in the level of economic activity across many sectors. An alternative concept is the growth cycle, where economic fluctuations are characterized as being above or below an unobservable trend. One attractive feature of the classical business cycle is that it is not necessary to estimate an unobserved trend. This is particularly important when it comes to forecasting turning points, since the uncertainty in the measurement

[1] Næs, Skjeltorp, and Ødegaard (2011) and Aastveit and Trovik (2012) document the role of financial indicators for forecasting Norwegian economic aggregates, and Martinsen, Ravazzolo, and Wulfsberg (2014) the role of survey data.