Socio-Economic Planning Sciences 48 (2014) 105–114

Contents lists available at ScienceDirect

Socio-Economic Planning Sciences

journal homepage: www.elsevier.com/locate/seps

Forecasting welfare caseloads: The case of the Japanese public assistance program

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ARTICLE INFO

Article history:
Available online 7 November 2013

JEL classification:
C53
H75
H68
I32

Keywords:
Public assistance
Welfare caseload
Forecast combination
Japan

ABSTRACT

Forecasting welfare caseloads has grown in importance in Japan because of their recent rapid increase. Given that the forecasting literature on welfare caseloads only focuses on US cases and utilizes limited classes of forecasting models, this study employs multiple alternative methods in order to forecast Japanese welfare caseloads and compare forecasting performances. In pseudo real-time forecasting, VAR and forecast combinations tend to outperform the other methods investigated. In real-time forecasting, however, a simple version of forecast combinations seems to perform better than the remaining models, predicting that welfare caseloads in Japan will surpass 1.7 million by the beginning of 2016, an approximately 20% increase in five years from the beginning of 2011.

1. Introduction

The volume of Public Assistance (PA) caseloads has been increasing since the early 1990s in Japan.[1] With its acceleration after 2008, caseload growth has been more rapid than ever, as shown in Fig. 1. Indeed, the number of PA-receiving households has almost doubled in the 12 years since 2001, increasing from 767,000 to 1,528,000. This rapid growth highlights potential problems that make forecasting PA caseloads more important than before. For example, given the typical sluggish adjustments of personnel in the government sector, caseload growth builds up caseworkers' workloads, exacerbating the logistical difficulties in delivering assistance to the poor. Accurate forecasts of welfare caseloads could thus help the public sector manage its personnel in order for it to meet future PA needs. In addition, growing caseloads may also cause appropriation problems among central and local governments.[2] The proportion of PA expenditure in local budgets reached as high as 20% in some municipalities, which also expands central budgets since the central government shares a fixed proportion (75%) of PA benefits, thereby complicating the issue of intergovernmental cost sharing for PA programs. Hence, accurate forecasts of PA caseloads would also help design better central–local fiscal relations for administering PA programs.

The empirical literature on welfare caseloads has two strands. The first group of studies has explored the determinants of welfare caseloads. While the majority of them focus on US cases, analogous studies exist for Canada [40,62], Sweden [30,63], Spain [5], and Japan [67]. While most studies examine the effect of unemployment, some explore such economic factors as the industry composition [33,43] and urbanization [16,43,57] of local

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[1] PA here refers to the comprehensive social assistance scheme in Japan that aims to guarantee that all citizens maintain their basic costs of living by providing benefits to those considered to be unable to earn incomes above the basic costs of living.

[2] The Japanese local government consists of two levels, with municipalities (cities, towns, and villages) as the first tier and prefectures as the second. Cities implement PA programs through their welfare offices. Towns and villages are not required to do so, but some of them do so with their own welfare offices. Prefectural welfare offices cover residents in towns and villages that do not implement PA programs.

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http://dx.doi.org/10.1016/j.seps.2013.10.002

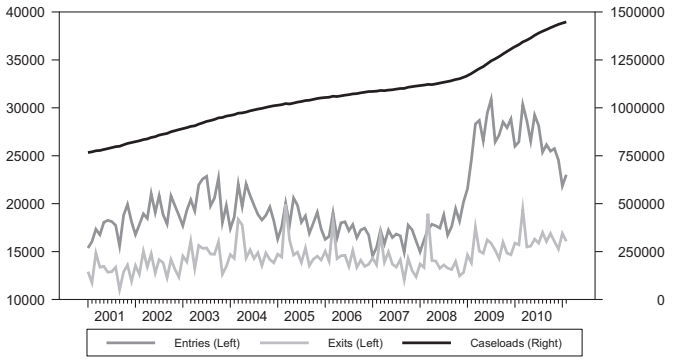

Fig. 1. PA caseloads in the 2000s.

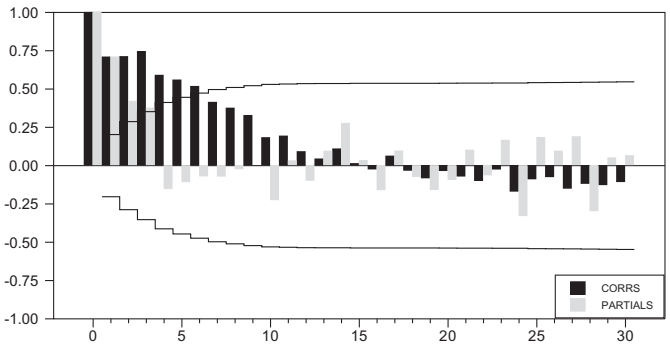

Fig. 2. Correlogram for $\Delta \ln C_t - \Delta \ln C_{t-12}$.

economies. Furthermore, the impact of personal income is examined by analyzing poverty rates [16,56,57,66] or income quintiles [10,35,40] in addition to the traditional measure of per capita income. Other measures are population proportions of demographic characteristics, such as educational background [10,12,34,35], gender [33,43], single motherhood [5,10,48,52,57,66], age [10,24,52], and race [10,12,33,35,36,46,47,52,57]. Some researchers have also examined the political orientation of public sector [10,16,35,36,52,62]. Finally, some works focus on the impacts of policy variables such as benefits levels [10,11,15,34–36,40,46–49,52,56,62,64,66,71], minimum wages [15,36,43,52,62], other assistance programs [5,10,15,24,30,34–36,46,48,52,63], and institutional changes.[3]

However, these "determinant" studies do not help much forecast caseloads, since the forecasts require the future values of such determinants.[4] In other words, to obtain forecasts from the determinant studies, one needs to either forecast the values of the determinants themselves or make a priori scenarios that predetermine the specific sequences of their future values. Doing so may be sensible for certain variables such as an intercept and a linear trend, but more difficult than forecasting the dependent variable (welfare caseloads) itself [53] or simply not justified [23].

The second strand of the literature therefore aims to overcome these difficulties by estimating self-contained time series models. Some such studies are explicit in expressing the prospects of utilizing their analyses for budgeting and operation in practice [28,29,42]. However, two gaps must be bridged. First, previous studies have only focused on US cases. Since forecasting welfare caseloads is integral to administering social policy in all countries, analogous analysis for different countries would contribute not only to policy practice in that country but also to our general understanding of welfare policy. Second, previous authors have not exploited forecasting models that go beyond the autoregressive integrated moving average (ARIMA) [3,13,42] or vector autoregression (VAR) models [4,42,58,61]. It would thus be interesting to explore alternative forecasting methods that analogous studies in other areas have utilized extensively [9,20,21,50].

This study contributes to the literature and policy practices in this regard by applying several forecasting models to PA caseloads in Japan. The caseload data investigated herein have a monthly frequency and span from 2001 M01 to 2011 M02. The forecasting models used include ARIMA, exponential smoothing (ES), Markov forecasting (MF), two logistic smooth threshold autoregression (LSTAR) models, VAR, and variations of forecast combinations (FCs). In pseudo real-time forecasting, VAR and FC tend to outperform the other methods. In real-time forecasting, by contrast, a simple version of FC seems to perform the best among the alternative models, predicting that Japanese welfare caseloads will surpass 1.7 million by the beginning of 2016, an approximately 20% increase in five years from the beginning of 2011.

The remainder of the paper is organized as follows. Section 2 introduces the forecasting methods employed in this study. Section 3 evaluates these methods. Section 4 conducts a real-time forecasting exercise for the period beyond 2011 M02. Finally, Section 5 concludes.

2. Forecasting models

The monthly averages of PA caseloads C_t are forecasted herein.[5] The sample spans from 2001 M01 to 2011 M02, which is then split into an in-sample period (2001 M01–2010 M02) and an out-of-sample period (2010 M03–2011 M02). What follows describes the alternative forecasting models along with their estimates.

2.1. Autoregressive integrated moving average

Autoregressive integrated moving average (ARIMA) is one of the most popular forecasting methods. ARIMA models can mimic the behavior of diverse types of series and do so adequately without usually requiring a number of parameter estimates in the final choice of the model [17]. Furthermore, they typically serve as a benchmark to evaluate other forecasting models. Indeed, many forecasters have applied ARIMA models to a number of time series in a variety of areas. Therefore, it is natural to start our discussion by applying ARIMA and the Box–Jenkins methodology to the analysis of PA caseloads here.[6]

The ARIMA analysis here examines the natural logarithm of monthly series of PA caseloads: $c_t \equiv \ln C_t$. Since the series is

[3] US studies have examined the effects of changes in the Aid to Families with Dependent Children (AFDC) made by the Omnibus Budget Reconciliation Act [55], Deficit Reduction Act [55], Job Opportunities and Basic Skills Training Programs [43,46,47,48], mandated AFDC-UP [10,52], and "waivers" from AFDC programs [8,10,15,24,37,46,52,56,57,71]. More recent US studies have considered the effect of the replacement of AFDC with the Temporary Assistance for Needy Families [8,34,35,43]. Some researchers have further allowed for the effects of the sub-elements (work requirements, time limits, incentives, diversion) of these welfare reforms [8,12,15,36,49,71].

[4] Some works have utilized dynamic models that have included the lagged values of the dependent variable in addition to these measures [5,33,39,40,43,44,71]. However, forecasting still requires the future values of unlagged measures [14,51,54].

[5] While MF directly forecasts C_t, the other methods forecast the natural logarithm of C_t, $c_t \equiv \ln C_t$, and then retrieve C_t as $C_t = \exp(c_t)$ when evaluating the forecast methods.

[6] In fact, several studies have modeled the sequence of welfare caseloads as an ARIMA process, although only one has used it for forecasting [42]. Others have used it to conduct intervention analyses [3,13,38].