Title	Forecasting and model selection in time-varying parameter models
Sub Title	
Author	Potiron, Yoann
Publisher	
Publication year	2020
Jtitle	科学研究費補助金研究成果報告書 (2019.)
JaLC DOI	
Abstract	Research went pretty well, which led to several papers submitted to econometric journals. It was quite a successful project, the output corresponds quite closely to the expectations.
Notes	研究種目 : 若手研究 (B) 研究期間 : 2017 ~ 2019 課題番号 : 17K13718 研究分野 : Financial Econometrics
Genre	Research Paper
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KAKEN_17K13718seika

様　式　Ｃ－１９、Ｆ－１９－１、Ｚ－１９　（共通）

科学研究費助成事業　　研究成果報告書

令和　２ 年　 ６ 月 ２０ 日現在

機関番号：３２６１２
研究種目：若手研究(B)
研究期間：2017～2019
課題番号：１７Ｋ１３７１８

研究課題名（和文）Forecasting and model selection in time-varying parameter models

研究課題名（英文）Forecasting and model selection in time-varying parameter models

研究代表者
ポチロン　ヨアン（Potiron, Yoann）

慶應義塾大学・商学部（三田）・講師

研究者番号：６０７８１１１９

交付決定額（研究期間全体）：（直接経費）　　3,300,000円

研究成果の概要（和文）：Research went pretty well, which led to several papers submitted to econometric journals. It was quite a successful project,the output corresponds quite closely to the expectations.

研究成果の学術的意義や社会的意義
The research academic and social significance was at the center of the research project, as estimating volatility on financial markets can help predict future financial crises, that could potentially impact everybody.

研究成果の概要（英文）：Research went pretty well, which led to several papers submitted to econometric journals. It was quite a successful project,the output corresponds quite closely to the expectations.

研究分野：Financial Econometrics

キーワード：high frequency data

１．研究開始当初の背景

Modeling dynamics is very important in various fields, including finance, economics, physics, environmental engineering, geology and sociology. (Semi)parametric time dependent models can deal with a special problem in dynamics, namely, the temporal evolution of systems. By definition, (semi)parametric approaches come with the strong assumption that an underlying parameter is non time-varying. On the contrary, as time goes by, the structure driving the observations is often evolving. To corroborate this natural skepticism, there exists a mass of empirical work which allows time-varying parameters model extensions, see Hastie and Tibshirani (1993) or Fan and Zhang (1999).

In a paper, Potiron and Mykland (2020), I introduce a general time-varying parameter model called Locally Parametric Model and show that we can estimate the "integrated parameter", which is an average over time of the underlying parameter. The target quantity is estimated using the original parametric estimator of the (non time-varying) parametric model. The asymptotic chosen is such that this can only be applied to high-frequency data. I insist on the fact that this technology can be used to solve a whole class of problems in high-frequency finance, such as estimating volatility (Zhang (2001)), high-frequency covariance (Hayashi and Yoshida (2005)), integrated betas (Mykland and Zhang (2009)), leverage effect (Wang and Mykland (2014)), volatility of volatility (Shephard and Sheppard (2012)), etc.

I had three projects that could go one step further my previous work. The first one is applying the technology to self or mutually exciting processes introduced by Hawkes (1971) to allow time-varying parameters in the model. The second one is investigating model selection in the Locally Parametric Model. The third one is about forecasting with a time series model, and can be applied to inflation, growth and consumption data.

２．研究の目的

In Project 1, the time-varying parameter Hawkes model provides a closer approximation to the actual data. Also, we obtain better forecasts than the ones obtained using the parametric model. In Project 2, we provide to the user of high-frequency asset price data a criteria to compare popular models. In project 3, we obtain better predictions in general structural time series models.

In Project 1, although it is commonly accepted that parameters are following an intraday pattern, as far as I know, no studies have been able to build a model which takes a proper account of this stylized fact. In Project 2, I will see non-parametric models as time-varying parameter models, and provide a criteria of comparison between them. This is novel in the sense that general model selection is a very hard problem for non-parametric models. In Project 3, the idea of time-varying parameter structural time series is not new. Nonetheless, I introduce a new way to forecast.

３．研究の方法

For Project 1, together with my collaborator Simon Clinet, we saw how the forecast compared to the ones coming directly from the parametric Hawkes model on high-frequency financial data using R software. In addition, we performed additional data analysis on the specific programs that we model, and implement several program evaluation estimators, which may change how we specify and estimate the model, and which may lead to additional research projects. We will plan to employ part-time workers to assist in data processing and analysis. I also intend to visit Paris to receive feedback from Professor Mathieu Rosenbaum at the Ecole Polytechnique on the results and modeling. For Project 2, I will do data analysis using also R software. This will involve a research collaborator Professor Per Mykland for meetings in Chicago or inviting him to Tokyo. I will lead the main programming effort. We will also employ part-time workers to assist on that project too. For Project 3, I will be meeting with Professor Tomoyoshi Yabu to discuss my work. I will be working on

growth, consumption and inflation data. I also intend to employ part-time workers for that project. I will also plan to present initial research results from the three research projects at international and domestic conferences Bachelier Meetings and Bernoulli Meetings. I will also present the research findings at seminars and workshops domestically. It is important to receive feedback on early research findings and modeling choices from experts in the field, which is why attending these conferences and visiting research collaborators is extremely important for the progress of the research. In addition, we aim for both projects to have a big research impact and therefore it is important to gain exposure for the ideas in order to publish well.

4．研究成果

Research went pretty well. It was quite a successful period,the output corresponds quite closely to the expectations, although some parts deviated slightly from the original purpose.

Among other things, I introduced and showed the existence of a Hawkes self-exciting point process with exponentially-decreasing kernel and where parameters are time-varying. The quantity of interest is defined as the integrated parameter, and I considered the high-frequency asymptotics. To estimate it naïvely, I chopped the data into several blocks, computed the maximum likelihood estimator (MLE) on each block, and took the average of the local estimates. The asymptotic bias explodes asymptotically, thus 0 provided a non-naïve estimator which is constructed as the naïve one when applying a first-order bias reduction to the local MLE. I showed the associated central limit theorem. Monte Carlo simulations show the importance of the bias correction and that the method performs well in finite sample, whereas the empirical study discusses the implementation in practice and documents the stochastic behavior of the parameters.

Indeed, I documented on financial stocks that the parameters of the Hawkes processes are moving intraday although the intraday seasonality pattern isn't as clear. Indeed from one day to the next, the paths are very much different and although intraday seasonality can definitely be considered as one factor, it seems that it can't solely explain such behavior

５．主な発表論文等

〔雑誌論文〕　計0件

〔学会発表〕　計0件

〔図書〕　計0件

〔産業財産権〕

〔その他〕

―

６．研究組織

	氏名 （ローマ字氏名） （研究者番号）	所属研究機関・部局・職 （機関番号）	備考