ECONOMIC AND SOCIAL RESEARCH COUNCIL
END OF AWARD REPORT

For awards ending on or after 1 November 2009

This End of Award Report should be completed and submitted using the grant reference as the email subject, to reportsofficer@esrc.ac.uk on or before the due date.

The final instalment of the grant will not be paid until an End of Award Report is completed in full and accepted by ESRC. Grant holders whose End of Award Report is overdue or incomplete will not be eligible for further ESRC funding until the Report is accepted. ESRC reserves the right to recover a sum of the expenditure incurred on the grant if the End of Award Report is overdue. (Please see Section 5 of the ESRC Research Funding Guide for details.)

Please refer to the Guidance notes when completing this End of Award Report.

<table>
<thead>
<tr>
<th>Grant Reference</th>
<th>RG.LUBS.475383 (RES-000-22-3161)</th>
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<tbody>
<tr>
<td>Grant Title</td>
<td>Threshold Regression Models in Dynamic Heterogeneous Panels</td>
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<tr>
<td>Grant Start Date</td>
<td>01.12.2008</td>
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<td>Grant End Date</td>
<td>30.11.2010</td>
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<td>Total Amount Expended</td>
<td>£ 73,135.78</td>
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<td>Grant holding Institution</td>
<td>University of Leeds</td>
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</table>
1. NON-TECHNICAL SUMMARY

Most econometric analysis has stopped short of studying nonlinear asymmetric mechanisms explicitly in dynamic panels especially when the number of time periods is fixed relative to the number of cross section units, though a limited number of studies investigate threshold and smooth transition models in static panels.

This project fills the gap in the literature by addressing the joint issues of how best to model nonlinear mechanisms and cross-sectional heterogeneity in dynamic panels (possibly with cross-sectional dependence). We advance two estimation methodologies for dynamic panels with threshold effects and endogeneity, namely (1) the first-differenced Generalised Method of Moments estimator and (2) the bias-corrected within estimator using an iterative bootstrap procedure.

We provide a number of useful extensions by embedding a threshold mechanism in a novel manner. First, we propose a nonlinear panel data model to deal with herding effects and endogenous cross-sectional dependence, in which the regressors (called the unit-specific aggregates) are selected only if other units are sufficiently close to the unit concerned. Next, we develop a nonlinear ARDL model with multiple threshold decompositions with which to investigate various asymmetric characteristics of the policy innovations and the arrivals of news.

We provide the asymptotic theory, Monte Carlo simulation exercises and a number of empirical applications for our proposed methodologies, all of which demonstrate their usefulness. Therefore, the various outputs of this project are expected to open new opportunities for both academics and practitioners to conduct important research in a wide variety of Economic and Financial applications.

2. PROJECT OVERVIEW

a) Objectives

This project develops novel methodologies for estimating threshold dynamic panels for large cross-section units and fixed time periods. Explicitly, the research project aims to:

1. Develop an extended FD-GMM estimation procedure based on threshold regression and FD-GMM techniques, as well as an iterative-bootstrap-based bias-corrected within estimation procedure for threshold dynamic panel models.
2. Develop both bootstrap- and subsampling-based inference for the (nonstandard) sampling distribution theory of the (possibly endogenous) threshold parameter and for testing threshold effects.
3. Consider a range of extensions which employ threshold mechanism in a broader context: modelling interactions across heterogeneous panel units for examining herding effects and allowing for (endogenous) cross-sectional dependence; developing a nonlinear ARDL-based error correction model with multiple threshold decompositions, with regressors decomposed into multiple partial sum processes to analyse asymmetric relationships in the short- and the
4. Derive the asymptotic theory of estimation and hypothesis testing for the proposed methodologies, and assess the validity of asymptotic approximations for finite samples via Monte Carlo simulation and bootstrap.
5. Apply the methodologies to several empirical applications in finance and macroeconomics. Specifically, conduct a series of empirical analyses of the company panel data, examining asymmetric dynamic capital structure adjustment, asymmetric investment sensitivity to cash flows and asymmetric corporate payout policy. Also analyse asymmetric monetary policy transmission mechanisms and the cross-section dependence of professional forecasts.

b) Project Changes

Please describe any changes made to the original aims and objectives, and confirm that these were agreed with the ESRC. Please also detail any changes to the grant holder's institutional affiliation, project staffing or funding. [Max 200 words]

There have been no major changes.
A couple of minor issues are as follows:

First, we have not set up the dedicated website, but decided to use the existing links such as the ESRC (Society Today) website, the school homepage, the member homepage of the Centre for Advanced Studies in Finance (CASIF) at Leeds University Business School, and the SSRN working paper series instead.

Second, we were not able to organise the Workshop during the project period. But, as seen below in Section 3(a), we have been quite active in presenting the papers at major international conferences including Econometric Society World Congress at Shanghai, 2010 (which holds every 5 year). We have also presented the papers at the seminars at many universities including the regular CASIF seminar series and annual conference.

In addition, we managed to save the funds considerably by using the existing computing softwares instead of buying new ones.

In sum, we have been able to produce more than 10 papers developed through this project, which is a far more than we have originally proposed. These research outputs and the user-friendly computer programs are readily available to both academics and practitioners.

c) Methodology

Please describe the methodology that you employed in the project. Please also note any ethical issues that arose during the course of the work, the effects of this and any action taken. [Max: 500 words]

In what follows, we present in detail our four novel methodologies developed within this project, as described in Objectives Section above.

In Seo and Shin (2011), we develop the estimation and inference methods for dynamic panels with threshold effects and endogeneity, which have not been studied in the existing literature. Depending on whether the threshold variable is endogenous or not, we propose two different estimation methods; the
first-differenced GMM and two-step least-squares estimators. We provide asymptotic distributions of these estimators, the sampling distribution theory of threshold parameters and the bootstrap-based testing procedure for the presence of threshold effects. The proposed methodology successfully applies to investigating threshold effects in dynamic panels with unobserved individual effects even when the number of time periods is fixed.

In Shin and Kim (2011), we advance an alternative bias-corrected procedure for estimating dynamic panels with threshold effects by employing an iterative bootstrap technique. Similar to the approach introduced in linear dynamic panels by Everaert and Pozzi (2007), our Monte Carlo simulations confirm that the proposed approach can reduce the bias of the within estimator substantially whilst maintaining the higher efficiency relative to the FD-GMM estimators. In a related study, Dang, Kim and Shin (2010), we conduct extensive empirical and Monte Carlo simulation analysis, and find that the bootstrap-based bias correction method achieves the most plausible and robust results and outperforms the FD-GMM estimators.

In Kapetanios, Mitchell and Shin (2010), we propose a novel nonlinear panel data modelling approach that can incorporate herding effects and allow for cross-sectional dependence endogenously. The distinguishing feature of this approach is the use of the unit-specific aggregate of predetermined regressors related to other units that are close to each other for modelling nonlinear dynamics. We focus on a threshold mechanism in constructing the unit specific aggregate, but also consider a number of alternative nonlinear specifications. We provide the asymptotic theory, Monte Carlo analysis and two empirical illustrations for stock returns and the survey of professional forecasts, all of which demonstrate the usefulness of the proposed approach.

In Greenwood-Nimmo, Shin and van Treeck (2011), we extend the asymmetric autoregressive distributed lag (ARDL) model advanced by Shin, Yu and Greenwood-Nimmo (2009) by use of carefully constructed partial sum processes of multiple threshold decompositions of the changes in regressors. We provide the asymptotic theory for a nonlinear ARDL model with multiple threshold decompositions together with Monte Carlo simulation studies and an application to the Canadian Phillips curve with three threshold decompositions.

We have constructed two large panel datasets of UK and US firms, collected from Datastream and CRSP/Compustat, and several time series data. We have also written the computer programs available with user-friendly readme files. These (except for the data from CRSP/Compustat) will be downloadable from the ESRC (Society Today) archive. The research outputs are also readily available to both academics and practitioners through existing research links such as such as the ESRC website, the member homepage of the Centre for Advanced Studies in Finance (CASIF) at Leeds University Business School, and the SSRN working paper series.

d) Project Findings
Please summarise the findings of the project, referring where appropriate to outputs recorded on the ESRC website. Any future research plans should also be identified. [Max 500 words]

Applying the novel econometric techniques developed through this project (see Methodology Section above), we open up new opportunities for investigating various important empirical issues in Economics and Finance. In addition, this project has produced a number of empirical papers, which demonstrate the usefulness of the proposed approaches.

In Dang, Kim and Shin (2011), we apply the FD-GMM techniques to a dynamic threshold panel model of leverage. Using an unbalanced panel of UK firms over 1996-2003, we find that firms deviating considerably from the target leverage undertake faster adjustment, low-growth firms adjust more
quickly, and internal financial constraints significantly reduce the speed of adjustment. The paper documents strong evidence of a positive relationship between leverage and the speed of adjustment, a finding consistent with the dynamic trade-off theory. In Dang, Garrett and Nguyen (2010), we find international evidence that for firms in France, Germany, Japan, the UK and US there is asymmetry in the speed of adjustment towards the target leverage. In particular, firms that have a financing deficit and are over-levered adjust towards their target leverage fastest. Furthermore, Dang (2010) examines the puzzling empirical fact that many firms have zero leverage, and finds that zero-leverage firms are more likely to lever up when they increase in size or deviate farther from target leverage. In Dang, Kim and Shin (2010), we conduct extensive empirical and Monte Carlo simulation analysis for evaluating a complex dynamic capital structure, and find that the bootstrap-based bias correction method can appropriately estimate target leverage, towards which adjustment takes place at a moderate speed.

In Mastromarco, Serlenga and Shin (2010, 2011), we estimate a stochastic frontier panel data model with both threshold effects and cross section dependence, and derive a robust measure of dynamic efficiency terms for 26 developed and 18 developing countries over 1970-2006. Employing trivariate VAR analysis, we find that FDI shocks play a more important role in accelerating technology catch-up for developed countries while trade shocks have significant lagged impacts in spreading efficiency externalities for developing countries.

The nonlinear ARDL modelling techniques have been applied to investigating various important empirical issues such as the asymmetric unemployment-output relationship and asymmetric retail gasoline price adjustments (Shin, Yu and Greenwood-Nimmo, 2009), a switch from short-run positive asymmetry to long-run negative asymmetry in the patterns of pass-through from policy-controlled interest rates to longer-term rates (Greenwood-Nimmo, Shin and van Treeck, 2010), asymmetric price impacts of order flows on exchange rate dynamics (Nguyen and Shin, 2011), and fundamental asymmetries in US monetary policymaking (Greenwood-Nimmo, Kim, Shin and van Treeck, 2011).

Finally, the methodologies developed above will be extended to address the following important issues: (i) asymmetry in corporate payout policy, (ii) asymmetric volume and price patterns in stock markets, (iii) a dynamic asymmetric panel error-correction model of interest rate pass-through with cross section dependence in the Euro area, and (iv) the quantile and the panel data extension of the nonlinear ARDL model, to name a few. These projects are currently in progress, joint with a number of internal and external collaborators, which are expected to open up new research funding opportunities.

c) Contributions to wider ESRC initiatives (eg Research Programmes or Networks)
If your project was part of a wider ESRC initiative, please describe your contributions to the initiative’s objectives and activities and note any effect on your project resulting from participation. [Max. 200 words]

The research has contributed to wider ESRC initiatives in a number of indirect ways as follows:

There has been much interest in our works from academics. In particular, the research papers have been presented at major international conferences, opening up new opportunities for further research collaboration at a global level. We have published a few papers in the leading journals in Econometrics, but also expect to publish a number of papers in the leading journals in Econometrics, Economics and Finance (see Sections 3a and 3b below).

The research outputs and the user-friendly computer programs are readily available to both academics and practitioners including the central bank policymakers, firm managers and stock market analysts through existing research links such as the ESRC website, the school homepage and the SSRN working paper series, and through individual links (e.g., the Bank of Korea, the ECB, and the IMK, Dusseldorf).
Finally, the research outputs have also been partially disseminated through special lectures on the dynamic panel data modelling to both graduate students at Universities of Leeds and Yonsei, and the practitioners including the macro-policy analysts at the IMK (Dusseldorf) and the Bank of Korea.

3. EARLY AND ANTICIPATED IMPACTS

a) Summary of Impacts to date

Please summarise any impacts of the project to date, referring where appropriate to associated outputs recorded on the ESRC website. This should include both scientific impacts (relevant to the academic community) and economic and societal impacts (relevant to broader society). The impact can be relevant to any organisation, community or individual. [Max. 400 words]

We have disseminated the works undertaken by this project as follows:

Conferences:

Yongcheol Shin


Viet Anh Dang


Seminar Presentations
Yongcheol Shin at Universities of Goethe, Leeds, Leicester, Nottingham, Korea, Kyunghee, Seogang, SungKunKwan, Yonsei, Pusan, the IMK (Dusseldorf) and the Bank of Korea.

Viet Anh Dang at National Economics University (Hanoi), Universities of Leeds and Manchester.

Publications & Journal Submissions:


b) Anticipated/Potential Future Impacts
Please outline any anticipated or potential impacts (scientific or economic and societal) that you believe your project might have in future. [Max. 200 words]

We wish to make further contributions by presenting the papers at major conferences and publishing them in leading journals.

Conferences:

Yongcheol Shin

"Inference for Dynamic Panels with Threshold Effects and Endogeneity" Far East and South Asia Meeting of the Econometric Society, Korea University, August 2011.

Viet Anh Dang

Journal Submissions:

Seo, M. and Y. Shin (2011) "Inference for Dynamic Panels with Threshold Effects and Endogeneity"
You will be asked to complete an ESRC Impact Report 12 months after the end date of your award. The Impact Report will ask for details of any impacts that have arisen since the completion of the End of Award Report.
4. DECLARATIONS

Please ensure that sections A, B and C below are completed and signed by the appropriate individuals. The End of Award Report will not be accepted unless all sections are signed. Please note hard copies are NOT required; electronic signatures are accepted and should be used.

A: To be completed by Grant Holder

Please read the following statements. Tick ONE statement under ii) and iii), then sign with an electronic signature at the end of the section (this should be a image of your actual signature).

i) The Project

This Report is an accurate overview of the project, its findings and impacts. All co-investigators named in the proposal to ESRC or appointed subsequently have seen and approved the Report.  

ii) Submissions to the ESRC website (research catalogue)

Output and impact information has been submitted to the ESRC website. Details of any future outputs and impacts will be submitted as soon as they become available.  

OR
This grant has not yet produced any outputs or impacts. Details of any future outputs and impacts will be submitted to the ESRC website as soon as they become available.  

OR
This grant is not listed on the ESRC website.

iii) Submission of Datasets

Datasets arising from this grant have been offered for deposit with the Economic and Social Data Service.  

OR
Datasets that were anticipated in the grant proposal have not been produced and the Economic and Social Data Service has been notified.  

OR
No datasets were proposed or produced from this grant.