

NAKE

Nieuws

volume 8, number 2

November 1996

Netwerk Algemene en Kwantitatieve Economie

Netherlands Network of Economics

Board

Prof. dr. ir. G. van der Laan (VU), Chairman
Prof. dr. T.J. Wansbeek (RUG), Secretary
Prof. dr. J. Muysken (RL), Treasurer and Vice Chairman
Prof. dr. H. Folmer (LUW)
Prof. dr. ir. J.G. de Gooijer (UvA)
Prof. dr. T. Kloek (EUR)
Prof. dr. Th.C.M.J. van de Klundert (KUB)

Educational Programme Committee

Vacancy, Chairman
Dr. P. de Gijsel (RL)
Prof. dr. J. James (KUB)
Prof. dr. ir. J. van Ours (EUR)
Dr. E. Schoorl (RUG)
Prof. dr. H.N. Weddepohl (UvA)

Director

Prof. dr. B.J. Heijdra (UvA)

NAKE Secretariat

Ms. José C.M. Dijkzeul
Roetersstraat 11
1018 WB Amsterdam
Phone: 020-525.4199 / Fax: 020-525.5280.
(Office staffed on Monday, Tuesday, Thursday, and Friday.)
E-mail: nake@fee.uva.nl
Home Page: http://www.fee.uva.nl/vak_groep/nake

PREFACE

Several extremely pleasant things have happened to NAKE in the last few months. First, the AIO Presentation Day which was held at Tilburg University on October 25th went well. The sessions were good, well attended, and the discussions were lively. Sometimes it helps to complain, perhaps, but I am nevertheless investigating whether the format of the AIO Presentation Day needs to be changed. Expect news regarding this issue in these pages in the near future.

The second upward boost to my (and I hope also your) utility level was caused by the recent NAKE Workshop which was held from June 3-7 at the Free University in Amsterdam.¹ **David Romer** gave an excellent 'crash-course' in New Keynesianism and thus provided further evidence in favour of the Van de Klundert thesis which states that 'All Romers are good.' **David Hendry** indeed proved to be the gifted and inspiring lecturer that he was announced to be. Despite the fact that his topic, forecasting in non-stationary processes, is quite technical and probably too much so for many general economists, he managed to achieve a very high client retention rate. **Jan de Vries** not only gave a series of brilliant and very erudite lectures on economic history, but he also turned out to be an excellent tour guide. Whereas the host was occasionally prone to get himself and his company lost in the maze of canals and little side streets in the Amsterdam city centre, de Vries always managed to get us to where we had to go in time. Last but not least, **James Mirrlees** gave an excellent set of highly intuitive lectures on welfare economics and public policy.

An *ex post* rather amusing discussion took place (at one of the dinners we had) between David Hendry and James Mirrlees concerning the value of prizes. Having been colleagues at Oxford, they apparently had had this discussion before. It went something like this. Hendry: 'Jim, I know you don't like prizes.' Mirrlees: 'Yes, because for every person who gets a prize you can name ten others who should also get it in that case.' I don't recall what happened after that, nor what prompted the discussion in the first place, but (as you undoubtedly all know) four months later, James Mirrlees was awarded the Nobel Prize in Economics, jointly with William Vickrey.² The economics profession thus disagrees with Mirrlees (and agrees with Hendry). He and Vickrey have made the **vital** contributions, and the ten others have made **valuable** contributions.

In this *NAKE Nieuws* you find the best reports on the four lecturers. **Richard Nahuis** (CPB and KUB) reports on 'Lectures on Economic History' by Jan de Vries. **Iman van**

¹An general overview of this workshop can be found in H. van Dalen & B.J. Heijdra, 'Grensverleggers aan het werk,' *Economisch Statistische Berichten*, Nr. 4066, 17 July 1996, pp. 629-631. Detailed reports on the lectures are found in this *NAKE Nieuws*.

²See P. Bolton & A. Roëll, 'Nobelprijs 1996: Informatie en prikkels in de economie,' *Economisch Statistische Berichten*, 30 October 1996, pp. 888-892.

Lelyveld (KUN) writes on 'New Keynesian Theories of Fluctuations' by David Romer. **Xander Tieman** (VU) gives his impressions on 'Forecasting in Non-Stationary Processes' by David Hendry. Last but not least, **Theo Leers** (KUB) writes on 'Welfare Economics and Public Policy' by James Mirrlees.³

The third piece of good news concerns the very high quality of the field of lecturers for the forthcoming NAKE Workshop to be held December 9-13 at Maastricht University. Elsewhere in this *NAKE Nieuws* you find details on the courses, registration forms, etcetera. Professor **Martin Eichenbaum** (Northwestern University) will give the macroeconomics lectures on the topic of 'Real Business Cycle Theory.' Professor **Bruce Hansen** (Boston College) gives lectures on 'The Econometrics of Structural Change and Thresholds.' Professor Hansen has recently published a very interesting review article on Hendry's work in the *Economic Journal*. In this article it is made clear that Hansen and Hendry agree on a lot of issues but also disagree on some others. This divergence of views could give rise to some interesting discussions in views of Hendry's recent visit. There are more links to the June 1996 workshop. The microeconomics lectures will be given by Professor **Paul Klemperer** (Oxford University), who is the successor of Mirrlees as Edgeworth Professor at the University of Oxford. He will lecture on 'The Economics of Auctions,' a timely topic in view of the fact that Vickrey received his Nobel prize for his work on auctions. Finally, Professor **Jürgen von Hagen** (University of Mannheim) will lecture in and on Maastricht. The title of his series is 'Lectures on Monetary Unification.'

The fourth good thing is that the second half of our Utrecht program is almost upon us. In the back of this *NAKE Nieuws* you a list of the courses on offer in blocks III and IV. The selection should be broad enough for everybody to find something to her/his liking. Please use the registration form in the middle of this *NAKE Nieuws* to register.

The fifth positive sensory stimulus is formed by our birthday. NAKE's age has reached 'double-digit' proportions and we *NAKE*-ans know how to celebrate appropriately!

³Theo Leers deserves another feather in his cap for managing to get part of his report published. See Th. Leers, 'Directe of indirecte belastingen,' *Economisch Statistische Berichten*, 30 October 1996, p. 893.

NAKE WORKSHOP

9 - 13 December 1996

Maastricht University

During the week from Monday, December 9th to Friday, December 13th, the Netherlands Network of Economics (NAKE) will organize a Ph.D. workshop. Four distinguished economists will teach intensive courses on microeconomics, macroeconomics, econometrics and international monetary economics. Each course consists of five lectures spread out over five days.

Courses

Martin Eichenbaum, Northwestern University

'Real Business Cycle Theory'

Jürgen von Hagen, University of Mannheim

'Lectures on Monetary Unification'

Bruce Hansen, Boston College

'The Econometrics of Structural Change and Threshold Effects'

Paul Klemperer, University of Oxford

'The Economics of Auctions'

Register by filling out the form located in the middle of this *NAKE Nieuws* and returning it to the NAKE secretariat **AS SOON AS POSSIBLE**.

**PROVISIONAL PROGRAMME NAKE WORKSHOP
MAASTRICHT, 9 - 13 DECEMBER 1996**

Monday December 9	Tuesday December 10
<p>09.30 - 10.30 <i>registration/coffee</i> 10.30 - 11.45 Eichenbaum 12.00 - 13.15 Hansen</p> <p><i>13.15 - 14.15 Lunch</i></p> <p>14.15 - 15.30 von Hagen 15.45 - 17.00 Klemperer</p> <p><i>17.00 - 18.00 Welcome reception</i></p>	<p>09.00 - 10.45 Klemperer 11.15 - 13.00 Eichenbaum</p> <p><i>13.00 - 14.15 Lunch</i></p> <p>14.15 - 16.00 von Hagen 16.15 - 18.00 Hansen</p>
Wednesday December 11	Thursday December 12
<p>09.00 - 10.30 Hansen 10.45 - 12.15 Klemperer</p> <p><i>12.15 - 13.30 Lunch</i></p> <p>13.30 - 15.00 Eichenbaum 15.15 - 16.45 von Hagen</p> <p>16.45 - 18.15 Private consultations</p>	<p>09.00 - 10.45 von Hagen 11.15 - 13.00 Hansen</p> <p><i>13.00 - 14.15 Lunch</i></p> <p>14.15 - 16.00 Klemperer 16.15 - 18.00 Eichenbaum</p> <p><i>20.00 workshop dinner</i></p>
Friday December 13	
<p>09.00 - 10.30 von Hagen 10.45 - 12.15 Klemperer</p> <p><i>12.15 - 13.30 Lunch</i></p> <p>13.30 - 15.00 Eichenbaum 15.15 - 16.45 Hansen</p> <p><i>16.45 - ... Closing drinks</i></p>	

REGISTRATION

Participation in the workshop is free for AIO's/OIO's of the institutions participating in NAKE, and includes tea, coffee, lunches, reception, as well as dinner on Thursday. The participants cover the costs of accommodation, breakfast, and the Course Readers. These costs, together with travel expenses, can however be declared at the faculties. Hotel rooms are available in the **Hotel de la Bourse and Hotel Pauw**. It is possible to share a room. Approximate prices are **f 115,- (single room Hotel de la Bourse) and f 150,- and f 200,- (double room Hotel Pauw)**.

The number of participants in the workshop is limited. NAKE students have precedence, and the date of receipt of the registration form is also taken into consideration. Since firm arrangements must be made for lunches, dinner, accommodation etc., we would like you to notify the NAKE secretariat in case of any alterations to your plans. You register by filling out the form on the middle page (as completely as possible) and returning it to the NAKE secretariat **AS SOON AS POSSIBLE**. Upon registration you will receive written confirmation together with readers for the courses, hotel information, etc.

A number of AIO's/OIO's will be presented with the NAKE diploma during the workshop dinner on Thursday evening.

PRIVATE CONSULTATIONS

During the workshop it is possible for participants to have a one-to-one talk with one (or more) of the lecturers. Students who wish to confer with one of the lecturers about their research are invited to hand in a brief (one-page) description of the research (-proposal) they would like to discuss. Each consultation will be approximately 30 minutes.

METHOD OF ASSESSMENT AND CREDITS

The NAKE workshops are obligatory for all first- and second-year graduate students following the NAKE programme. Hence, each student must attend at least four workshops. For three workshops the student must submit a written summary of the lectures of one course. This report must be based both on the notes taken during the workshop and on the assigned literature. These reports are assessed by the organiser(s) of the workshop. All (NAKE) students are expected to attend all sessions on offer during the workshop.

With regard to study intensity, participation in the workshop (including the assessment by means of the written report) is worth 2 "Study Points" (SP); 1 SP = 40 hours.

ADDRESSES AND INFORMATION

Location: Maastricht University
Faculty of Economics and Business Administration
Tongersestraat 53
Room 1013

Information: NAKE Secretary, Ms. José Dijkzeul
Roetersstraat 11, 1018 WB Amsterdam.
Phone: 020-525-4199,
Fax: 020-525-5280,
E-mail: nake@fee.uva.nl
Home page: http://www.fee.uva.nl/vak_groep/nake

Hotels:	Hotel de la Bourse	Hotel Pauw
	Markt 37	Boschstraat 27
	6211 CK Maastricht	6211 AS Maastricht
	Phone: 043-321-8112	Phone: 043-321-2222
	Fax: 043-321-7706	Fax: 043-321-3432

Local organizers: Marco Haan, 043-388-3642
Thomas Zwick, 043-388-3642
Perry Verberne, 043-388-3885

COURSE OUTLINES DECEMBER WORKSHOP**The Econometrics of Structural Change and Thresholds****Bruce Hansen**

Starred (*) readings are included in the reader. The other listed papers are for reference.

I. Structural Change*A. Testing*

- 1 . *Andrews (1993) "Tests for parameter instability and structural change with unknown change point," *Econometrica*, 61, 821-856.
- 2 . *Stock and Watson (1996) "Evidence on structural instability in macroeconomic time series relations," *Journal of Business and Economic Statistics*, 14, 11-30.
- 3 . Andrews and Ploberger (1994) "Optimal tests when a nuisance parameter is present only under the alternative," *Econometrica*, 62, 1383-1414.
- 4 . Sowell (1996) "Optimal tests for parameter instability in the generalized method of moments framework" *Econometrica*, 64, 1085-1108.
- 5 . Hansen (1995) "Approximate asymptotic p-values for structural change tests," *Journal of Business and Economic Statistics*, forthcoming.
- 6 . Hansen (1996) "Testing for structural change in conditional models," manuscript, Boston College.

B. Estimation

- 1 . *Bai (1996) "Estimation of a change point in multiple regression models," manuscript, M.I.T.
- 2 . Bai (1994) "Least squares estimation of a shift in linear processes," *Journal of Time Series Analysis*, 15, 453-472.

C. Multiple Structural Change

- 1 . Bai and Perron, (1994) "Testing for and estimation of multiple structural changes," manuscript, M.I.T.
- 2 . Bai (1996) "Estimating multiple breaks one at a time," manuscript, M.I.T.

II. Time-Varying Parameters*A. Testing*

- 1 . *Nyblom (1989) "Testing for the constancy of parameters over time," *Journal of the American Statistical Association*, 84, 223230-

B. Estimation

- 1 . Hamilton (1994) "State-Space Models," in *Handbook of Econometrics*, Vol IV, 3039-3080.
- 2 . Stock and Watson (1996) "Asymptotically median unbiased estimation of coefficient variance in a time varying parameter model," manuscript, Harvard University.

III. Unit Roots, Cointegration and Structural Change*A. Unit Roots versus Structural Change*

1. *Perron (1989) "The great crash, the oil price shock and the unit root hypothesis," *Econometrica*, 57, 1361-1401.
 2. * Zivot and Andrews (1992) "Further evidence on the great crash, the oil-price shock and the unit-root hypothesis," *Journal of Business and Economic Statistics*, 10, 251-270.
- B. Testing Null of No Cointegration*
1. * Gregory and Hansen (1996) "Residual-based tests for cointegration in models with regime shifts," *Journal of Econometrics*, 70, 99-126.
 2. Gregory and Hansen (1996) "Tests for cointegration in models with regime and trend shifts, " *Oxford Bulletin of Economics and Statistics*, 58, 555-560.
 3. Quintos "Rank constancy tests in cointegrating regressions," manuscript, Washington University.
- C. Testing Null of Parameter Stability*
1. Hansen (1992) "Tests for parameter instability in regressions with I(1) processes," *Journal of Business and Economic Statistics*, 10, 321-335.
 2. *Seo (1995) "Tests for structural change in cointegrated systems," manuscript, University of Rochester.
 3. Gregory, Nason and Watt (1996) "Testing for structural breaks in cointegrated relationships," *Journal of Econometrics*, 71, 321-342.
 4. Kuo "Tests for partial parameter instability in regressions with I(1) processes," manuscript, Institute of International Trade, National Cheng-Chi University, Taiwan.
- IV. Threshold Models (Cross-Sectional Structural Change)**
- A. Testing*
1. *Hansen (1996) "Inference when a nuisance parameter is not identified under the null hypothesis" *Econometrica*, 64, 413-430.
 2. Andrews (1994) "Empirical Process Methods in Econometrics," in *Handbook of Econometrics*, Vol IV., 2248-2296.
- B. Estimation*
1. *Hansen (1996) "Sample splitting and threshold estimation," manuscript, Boston College.
 2. Hansen (1996) "Estimation of TAR models," manuscript, Boston College.
 3. Chan (1993) "Consistency and limiting distribution of the least squares estimator of a threshold autoregressive model," *Annals of Statistics*, 21, 520-533.

The Economic of Auctions

Paul Klemperer

Auction theory has numerous applications in microeconomics including in industrial economics, public economics, labour economics and finance, and it has also helped our understanding of price formation in markets. This course is an introduction to the theory

of auctions. It analyses optimal auctions and equilibrium bidding strategies in commonly used auctions, and also discusses some applications of the theory.

There is no required pre-course reading, but any student who knows nothing about auctions would find William Vickrey's classic 1961 *Journal of Finance* pp. 8-37 paper (especially Sections II, III, IV) a useful introduction to the issues. It was in large part for this work that he was awarded the Nobel Prize a few weeks ago. Other useful introductory material would be McAfee and McMillan 1987 *Journal of Economic Literature* pp. 699-738, and Milgrom 1989 *Journal of Economic Perspectives* pp. 3-22.

Real Business Cycle Theory

Martin Eichenbaum

Course Outline

- (1) *The basic one sector growth model with technology and government purchases.*
Reading: Cooley, Thomas and Edward Prescott, 'Economic Growth and Business Cycles', *Frontiers of Business Cycle Research*, ed. Thomas Cooley, 1995.
- (2) *Asset pricing in the basic model.*
Reading: Cochrane, John, 'Notes on Asset Pricing', manuscript, University of Chicago.
- (3) *Empirical Strengths and Weaknesses of the basic model.*
- (4) *Introducing money into the model. Money in the utility function and cash in advance models.*
Reading: Sargent, T.J., 'Dynamic Macroeconomic Theory', Chapters 4 and 5, revised Sargent notes.
- (5) *The monetary transmission mechanism. Some facts.*
- (6) *Sticky Prices and Credit Market Imperfections models.*

Reading: Lawrence J. Christiano, Eichnebaum, Martin and Charles Evans, 'Sticky Price and Limited Participation Models: A Comparison', manuscript, Northwestern University.

(7) *Comments of labor market imperfections.*

(8) *Optimal monetary policy.*

Reading: Lawrence J. Christiano, V.V. Chari and Martin Eichenbaum, 'Expectation Traps and Discretion', manuscript, Northwestern University, 1996.

Lectures on Monetary Unification

Jürgen von Hagen

Not available yet. Will be handed out at the workshop.

James A. Mirrlees

Welfare Economics and Public Policy

Report by Theo Leers, Tilburg University

Introduction and Summary

The topics of the lectures of James Mirrlees included several issues concerning individual and social economic welfare. But not only the welfare properties of economic equilibria were analysed. In addition, James Mirrlees focused on the consequences of public policy, and especially taxation in the broadest sense of the word. Taxation, direct and/or indirect, usually affects large groups of different economic agents. How can we determine what tax structure best serves the interests of the different agents and therefore the interests of the government? Because of the diversity of the agents, the outcomes of public policy decisions might be positive for one type of agents while on the other hand it might be negative for others.

The first lecture is devoted to the measurement of changes in individual and social welfare. The second lecture pays attention to the two fundamental welfare theorems. Furthermore it sheds some light on related issues such as the welfare implications of efficient production, profit maximization and the existence of externalities. Both lectures are based upon Mirrlees (1995). The third lecture is divided into two parts. In the first part James Mirrlees discusses the Brito, Sheshinski and Intriligator (1991) paper on the welfare implications of compulsory vaccinations. The second part of the lecture is devoted to the controversy between second best and taxation and the use of so-called generalized tax schedules as discussed in Piketty (1993). Lecture four deals with the controversy between direct and indirect taxation. Furthermore, the optimal indirect tax rate is derived. The final lecture is mainly devoted to non-linear income taxation, largely following the analysis of Diamond (1996). Furthermore there is also some attention paid to Wilson (1991), which focusses on the effect of public goods on total tax revenues.

The report tries to give a descriptive representation of the lectures. For a more formal and technical representation of the issues the reader is referred to Laffont (1988) for the first two lectures and to Atkinson and Stiglitz (1980) for the other lectures.

Lecture 1: Measurements for Welfare

The starting point of the first lecture is the discussion of measuring welfare by focussing on individual welfare in an economy without taxation. In particular, it is pointed out that there does not exist an absolute measure for individual welfare. Consequently, the relevant principle for evaluating individual welfare is focussing on the implications of changes in quantities and

prices. The expenditure function is an excellent and easily applied tool for analyzing the changes mentioned above because it is a natural money measure of changes in individual utility. James Mirrlees points out that individual utility maximization and welfare maximization in general do not have to coincide. With respect to the life-time savings model Pigou already noticed that to maximize welfare savings have to be subsidized.

The most intriguing problem of welfare economics is the fact whether adding up welfare changes over people is ethical or even possible, because at the aggregate level some problems might arise. According to Arrow's theorem, a complete preference rule, satisfying desired properties like Pareto-optimality and independence-of-irrelevant-alternatives, has to be dictatorial. This also holds for collective choice rules that are Pareto-optimal and strategy-proof. Non-dictatorial and Pareto-optimal voting rules therefore imply that there is an incentive not to reveal true preferences. Thus, the requirement that social decisions should be based only on individual preference orderings seems too strong.

A social welfare function, which is formulated in a very general sense, and which depends upon the intensity of preference orderings of individuals cannot yield specific public policy conclusions. But if the separability conditions as mentioned in Mirrlees (1995) apply, social welfare can be represented by an utilitarian welfare function. In the remainder of the lectures James Mirrlees assumes that if all individuals are identical, the same representation of utility should be used for all individuals in the social welfare function. However, even in this framework it is possible to distinguish between individuals in the sense that commodities might have different meaning for them. An example of such a model is the consumption/efficient-labour model of the economy, in which different individuals have different abilities or productivity coefficients.

Lecture 2: Efficiency, Fundamental Welfare Theorems, and Externalities

The second lecture is divided into two related parts. The first part sheds some light on the two fundamental theorems of welfare and associated efficiency considerations. The second part is devoted to the analysis of externalities, partly focussing on the view of Coase (1960) with respect to them.

Efficiency, Fundamental Welfare Theorems

In Mirrlees (1995) it is stressed that the organization of production in an economy is of great importance for the evolving welfare implications. Production is called efficient if there is no technologically feasible way of producing more of something without using more inputs or producing less of some other output. In an economy two sources of inefficiency can be distinguished. Firstly, there is Leibenstein's (1966) concept of X-inefficiency, which refers to the fact that a single producer may be inefficient out of ignorance or laziness. Secondly

however, even if every individual producer is efficient there still might be allocative inefficiency in the economy because production activities do not interlock as well as they could.

Profit maximization by producers is not a sufficient condition for efficiency. For this relation to hold it is also required that all commodity prices are strictly positive (this is a very strong requirement). By treating the individual utilities as commodities, the first fundamental theorem of welfare states that a competitive equilibrium is Pareto-efficient. In Mirrlees (1995) an alternative version of this first fundamental theorem is discussed. James Mirrlees shows how an optimum can be implemented as a competitive equilibrium via redistribution of lump-sum transfers. If it holds that the production possibility set of a producer is convex, then for every efficient allocation there exist strictly positive commodity prices such that the efficient allocation coincides with profit maximization. The above results provide an easy way of ensuring aggregate production efficiency. In the absence of production externalities and assuming the existence of a strictly positive price vector, James Mirrlees shows that profit maximization leads to aggregate efficiency. This is known as the second fundamental theorem of welfare. For this result to hold it is crucial that all producers face the same prices, e.g. a competitive equilibrium, so the price mechanism enables decentralization.

Externalities

Furthermore, James Mirrlees pays attention to the existence of externalities. Whenever consumers directly influence each other's utility, or whenever the production of one producer affects another's production possibilities, one may speak of an externality. In general the existence of externalities, which is equivalent to the absence of a market where these effects can be traded, leads to a violation of the fundamental theorems of welfare. Therefore, the fundamental theorems can be extended to allow for externalities by creating a suitable market or, alternatively, by introducing virtual prices. Such a system of Pigovian prices expresses the social costs or benefits associated with the consumption or production of a commodity.

Because externalities might lead to non-convex preferences, it is not always possible to decentralize the optimal outcome by means of Pigovian taxes and subsidies. In the case of pollution control, non-convex preferences are caused by the fact that whenever pollution reaches a certain level, consumers suffering from the pollution might simply move away. Once they are relocated those consumers become indifferent to any further increase of the level of pollution. Coase (1960) also objected to a system of Pigovian taxes. He argued that externalities provide grounds for individuals to negotiate agreements with each other. Such negotiations bring about a Pareto-efficient outcome, whereas Pigovian taxes will not necessarily do so. In the case of pollution control the possibility to relocate gives inadequate incentives to minimize pollution and consequently pollution will be too high.

Lecture 3: Compulsory Vaccination, Second-best and Taxation.

This lecture is also devoted to two issues. The first issue is an application of externalities, the second addresses the controversy between second best and taxation.

Compulsory Vaccination

In the first part of this lecture an application of externalities is discussed on the basis of Brito, Sheshinski and Intriligator (1991). Their paper considers the relation between the existence of externalities and compulsory vaccination. It is claimed that if there are costs involved in being vaccinated, then for a very general class of models the competitive equilibrium is always better than the compulsory vaccination outcome. This can be made clear by a revealed preference argument. On the one hand, the group of agents who would have chosen not to be vaccinated in the competitive equilibrium are clearly worse off in the compulsory vaccination outcome. On the other hand, the agents who already chose to get vaccinated in the market allocation are unaffected by a compulsory vaccination. So, even though vaccinations do have a public good element, agents who are already vaccinated no longer care whether the others are also vaccinated. At least as long as the vaccination is perfect.

James Mirrlees stresses that the government can exploit the revelation properties of vaccination as part of a redistribution policy, achieving an even better allocation than the full information equilibrium via taxes on unvaccinated agents and subsidies to the vaccinated. From group discussion, it is noted that the lack of dynamics is a serious drawback of the above model.

Second Best and Taxation

In the second part of the third lecture, James Mirrlees sheds some light on the controversy between the attainability and implementation of first-best allocations and the existence of distortionary taxes. His analysis is largely based on Piketty (1993). James Mirrlees shows that by using so-called generalized tax schedules (GTS), which do not only depend on individual income characteristics but also on the income characteristics of the other agents in the economy, it is possible to implement any first-best Pareto-optimal allocation. This result highly contrasts with the general viewpoint that via ordinary or classical tax schemes only second-best allocations are attainable.

The implementation and working of such a GTS are explained in the context of a standard two-goods (consumption and efficient-labour) income taxation model, with a finite number of agents and a fixed probability distribution of characteristics, especially ability. This distribution is assumed to be common knowledge. James Mirrlees argues that in such an environment the government should use a tax schedule which not only depends on the income of the individual who has to pay the tax but also on the distribution of incomes of the other

agents present in the economy (GTS). Under such a GTS, an individual agent will in general not have any dominant strategy because he does not know the incomes announced by the other agents but only the distribution of the incomes, so implementation of a GTS relies on the well known Bayesian-Nash equilibrium concept. Under the assumption of common knowledge of the probability distribution and assuming that the agents face utility functions for which the Spence-Mirrlees property holds, which states that the marginal rate of substitution between consumption and efficient-labour is a decreasing function of ability (or alternatively, lower utility with higher productivity), James Mirrlees shows that any first-best allocation can be implemented through (unique) Bayesian-Nash equilibria. This rather complex procedure is made understandable through a simple example of an economy with only two types of agents, one with low ability and one with high ability. It is shown that the low-ability agents have a strictly dominant strategy and therefore the high-ability agents knowing this have also one (Bayesian-Nash) strategy. For a formal representation of this simple example one is referred to Piketty (1993, p.32)

Lecture 4: Direct versus Indirect Taxation

The aim of this lecture was to widen the discussion of optimal taxation beyond the Ramsey and income tax problems (see Atkinson and Stiglitz, 1980, chapters 12 and 13) in the framework of an economy with a diversity of consumers. James Mirrlees defines more precisely the role of income taxation and of indirect taxes. Through his analysis he sheds some light on the longstanding controversy between direct and indirect taxation: which of the two is preferable, and which role each should play.

To see how the tax structure may be viewed in more general terms, the tax levied on an individual may be written as a function of his or her number of hours of labour supplied, the wage rate, the individual consumption vector of available commodities and a vector of observable characteristics that may be relevant for tax purposes (for example family size, see Mirrlees, 1972). In the absence of savings, apparently the tax on income is equivalent to a uniform expenditure tax, especially it holds that a linear income tax is equivalent to a proportional indirect tax (e.g., a value added tax) plus a uniform lump-sum payment (a poll subsidy).

The distinction between direct and indirect taxes is on the one hand based on the method of administration and on the other hand on the economic effect of the different types of taxation. The latter distinction highlights the following essential aspects: indirect taxes are levied on transactions irrespective of the circumstances of the individual, whereas direct taxes can be adjusted to the individual characteristics.

To formalize the analysis, James Mirrlees introduces three mathematical tools. The first one is the *indirect utility function* of the individual agents. This function includes the

following arguments: the vector of consumer prices of the available commodities, which consists of producer prices plus a value added tax, the wage rate, which may vary among the individuals, and finally a uniform lump-sum subsidy (a poll subsidy). From these indirect utility functions he derives, by applying the well-known *Roy's Identity*, the individual consumption levels of the different commodities and the individual labour supply. The second tool that is introduced are the *welfare-weighted average demands* for the commodities and the *welfare-weighted average labour supply*. These welfare-weighted average demands can be interpreted as follows. If the welfare-weighted demand for a commodity is much higher than the unweighted average demand, the commodity can be viewed as a luxury good. The third tool is the *inverse demand functions*, which determine the consumer prices relative to the wage rate from the aggregate levels of consumption and labour supplied. In this context James Mirrlees points out that if the partial derivative of the inverse demand function with respect to the level of demand is small, the elasticity of the consumer price is high.

From previous research (see, for example, Atkinson and Stiglitz, 1980) it became clear that the simplest of direct taxes is superior to indirect taxation from the standpoint of minimizing excess burden. But this conclusion has to be modified when distributional objectives are involved in a framework with a diversity of agents, which may differ through their tastes and/or wage rates. Formally, the utilitarian government maximizes the social welfare function, which is a function of the individual indirect utility functions mentioned above, subject to a revenue constraint. The instruments the government uses are the VAT-rate and the poll subsidy. There is no tax on labor income. Via the use of the inverse demand functions and under the assumption of constant producer prices, James Mirrlees derives the first order conditions for consumption and labour supply. From these conditions the optimal indirect tax rates, which depend on the difference between welfare-weighted and unweighted demand, the partial derivatives of the inverse demand functions and the producer prices, are deduced.

Using the analysis above, James Mirrlees points out that the indirect tax rate relative to the producer price of a certain commodity should be higher whenever the difference between welfare-weighted and unweighted demand for this commodity is larger, thus higher taxes for luxury goods. Another conclusion that can be drawn from the formal analysis, is that in the original Ramsey-framework with identical consumers and three commodities, the commodity, which is complementary with labour, should be taxed more heavily. From the derived indirect tax system, it is rather easy to construct an equivalent tax system consisting of a VAT on commodities and a tax on labor income. The results also show that only in very special cases uniform taxation is optimal. For a good overview of the presented topics James Mirrlees refers to the book of Myles (1995), which also includes empirical results.

Finally, James Mirrlees pays attention to the production side of the economy. Through a similar analysis as performed above, he concludes that all producers should face the same prices, under the assumption that optimal production is always on the frontier (otherwise the allocation is not Pareto-optimal and society as a whole can improve). So (in the optimum) there should be no taxes on transactions between producers, which is a very strong result. The same should hold for imports and exports. In this context, James Mirrlees points out that under similar optimality conditions as derived for the demand side, the producers do not really face prices in the usual sense, but they actually face so-called shadow prices. For an extensive treatment of shadow prices in this context, one is referred to Drèze and Stern (1990).

Lecture 5: Public Goods and Non-linear Taxation

James Mirrlees devoted the final lecture to two different topics. The first part examines the role of public goods with respect to their contribution to the tax revenue. James Mirrlees presents and extends the results derived by Wilson (1991). The second, and major part of the lecture is devoted to the theory of non-linear taxation, partly following Diamond (1996).

Public Goods

James Mirrlees points out that it is often argued that the use of distortionary taxation decreases the optimal provision level of public goods below their first-best level. However, most of the frameworks into which this issue is embedded do not allow for lump-sum transfers or poll taxes. Mirrlees briefly shows that, following the analysis of Wilson, in a framework with a diversity of consumers and two tax instruments, a commodity tax and a poll tax/subsidy, the optimal provision level here exceeds the first-best level. Furthermore it is pointed out that in a framework, as mentioned above, public expenditure can positively affect government tax revenues, so formally speaking, the provision level of the public good has an effect on the inverse demand functions (see lecture 4) and therefore an indirect effect on the prices the consumers face.

Non-linear taxation

The major part of the final lecture was devoted to the theory of non-linear taxation. This issue is examined in a framework where agents differ through their difference in skill. The analysis follows Diamond (1996). A good overview of the theory of non-linear taxation can also be found in Atkinson and Stiglitz (1980, p. 435).

The framework for the analysis of the tradeoff between efficiency and income distribution of a certain tax policy was originally created in Mirrlees (1971). The analysis of Diamond (1996) argues that the case for nonconstant and high marginal tax rates is a strong one.

It is assumed that the government can vary the direct tax schedule. The analysis is performed in an economy consisting of a continuum of agents, with different skills, which are distributed according to a single-peaked, positive and continuous density function. Within this framework the government maximizes the integral over the population of (a concave function of) the individual utilities, subject to an aggregate budget or resource constraint and subject to the constraint that individuals optimize their supplied level of labour given the relation between work and disposable income. The aggregate budget constraint says that aggregate consumption plus government expenditures should be no greater than aggregate production. Furthermore, James Mirrlees introduces an additional necessary condition, an incentive compatibility constraint, which states that no individual prefers to imitate the earnings of an agent with a different skill level. Diamond (1996) points out that the resource and incentive compatibility constraints can also be stated in terms of taxes. Now the budget constraint says that taxes should cover government expenditures, and the incentive compatibility constraint says that the selected level of supplied labor should maximize the individual utility given the tax function.

Contrary to the analysis of Diamond (1996), who focusses on quasilinear preferences to avoid complications, the analysis of James Mirrlees proceeds in quite general terms. So the following complication arises. In the presence of distortionary taxes, income effects imply that poll taxes have efficiency effects because they affect the labor supply decision, which is already distorted. The solution to this problem is given by the so-called Atkinson-Stiglitz assumption, which states that within the overall utility function of an agent, there exists a subutility function from consumption. This subutility function has a smaller dimension than the consumption vector, so the scope of the original problem is reduced. Using this subutility function, James Mirrlees derives that at an optimum the derivative of this subutility function with respect to consumption has to be proportional to the producer price, therefore he argues that we do not need taxes on consumption goods.

Furthermore James Mirrlees points out some refinements and extensions. If it is possible to distinguish subgroups of consumption goods, one should tax uniformly within these subgroups. Finally he shows how in the Diamond case (Diamond, 1996) with quasilinear preferences an explicit expression for the marginal tax rate is derived.

As a kind of encore, James Mirrlees makes some general remarks on the optimal tax structure. The optimal tax structure has nonnegative marginal rates (Mirrlees, 1971), and positive rates in the interior of the income distribution (Seade, 1982). The marginal tax rate should be zero at the income of the top skill. If, in the presence of an optimal tax structure, there should be a group of individuals at the bottom of the skill distribution doing no work, then optimal marginal tax rate at the level where earnings begin should be positive.

References

- Atkinson, A.B. and J.E. Stiglitz (1980), *Lectures on Public Economics*, McGraw-Hill, England.
- Brito, D.L., E. Sheshinski and M.D. Intriligator (1991), "Externalities and Compulsory Vaccinations", *Journal of Public Economics*, **45**, 69-90.
- Coase, R.H. (1960), "The Problem of Social Cost", *Journal of Law and Economics*, **3**, 1-44.
- Diamond, P. (1996), "Optimal Income Taxation: An Example with an U-Shaped Pattern of Optimal Marginal Tax Rates", Paper prepared for the conference *Twenty-Five Years of the New Public Economics*, Jerusalem, January 14-16.
- Drèze, J. and N. Stern (1990), "Policy Reform, Shadow Prices, and Market Prices", *Journal of Public Economics*, **42**, 1-45.
- Laffont, J.-J. (1988), *Fundamentals of Public Economics*, MIT Press, Cambridge
- Leibenstein, H. (1966), "Allocative Efficiency Vs. 'X-Efficiency'", *American Economic Review*, **56**, 392-415.
- Mirrlees, J.A. (1971), "An Exploration in the Theory of Optimum Income Taxation", *Review of Economic Studies*, **38**, 175-208.
- Mirrlees, J.A. (1972), "Population Policy and the Taxation of Family Size", *Journal of Public Economics*, **1**, 169-198.
- Mirrlees, J.A. (1995), Lecture Notes: "Externalities and Public Goods", Oxford.
- Myles, G.D. (1995), *Public Economics*, Cambridge University Press, Cambridge.
- Piketty, T. (1993), "Implementation of First-Best Allocations via Generalized Tax Schedules", *Journal of Economic Theory*, **61**, 23-41.
- Seade, J.K. (1982), "On the Sign of the Optimum Marginal Income Tax", *Review of Economic Studies*, **49**, 637-643.
- Wilson, J.D. (1991), "Optimal Public Good Provision with Limited Lump-Sum Taxation", *American Economic Review*, **81**, 153-166.

Jan de Vries

Lectures on Economic History

A report by Richard Nahuis⁴

Professor De Vries expressed the feeling that he was the lecturer who had to teach 'iets leuks.' He succeeded. His lectures were interesting and fun to attend. In the first lecture he provided some general reflections on the position and method of historical economics. The remaining four lectures dealt with concrete, interrelated topics. The first is on the pre-industrial labour market, the second on the pre-industrial financial market, the third on the importance of demand vs. supply in the industrial revolution and the fourth was on the late industrialisation of Holland.

1. Historical Economics

Professor De Vries felt that he 'had to' devote the first lecture to general reflections on the relation between history (or historical economics) and economics. Why study historical economics, and what is the role of historical economics? In dealing with these questions we will consider what the differences are, why the two disciplines diverged and in what way some convergence now can be observed.

The fundamental differences between historical economics and mainstream neoclassical economics is the irreversibility of time that is inherent in historical analysis and that cannot be found in economic models. Besides that, historical economics is descriptive, narrative, inductive and focuses on unique events and examples. Economics, however, is analytical, deductive and focuses on general laws.

Another difference you might think of, is the difference in time span. Indeed, what is a parameter for the economist (tastes and institutions etc) is an endogenous variable for the historian. David (1993) argues that a long view does not change one into a historian. Neo-classical economist take *such* a long view such that the economy is in a state which would be attained when economic agents had accomplished all adjustments in endogenous variables, and therefore both initial condition, and intervening events in the past would have ceased to matter. Long run analysis *per se* is no 'cure' for a-historicism.

How did the different routes for history and economy come about? Was it Samuelson's rigor that made economics balance towards deductive analysis? Or Marshall? David argues

⁴Department of International Economic Analysis of the CPB Netherlands Bureau for Economic Policy Analysis, The Hague and Tilburg University. Mailing address: CPB, P.O. Box 80510, 2508 GM The Hague, The Netherlands.

that the focus on general laws can be traced back to Aristotle. Aristotle was eager to focus on what was natural, *i.e.* what contained the principle of change in itself, instead of on the accidental. Via the mechanical, deterministic view on the world of Newton, the work by Adam Smith was driven in the direction of search for 'natural laws.' You would expect that the evolutionary biology was a countervailing power, the contrary is true however, as it focused on cumulative processes involving continuous, imperceptible changes and excluded any role for the succession of discrete events. This brief history on the methodology of economics in itself shows that history is important. Had the clearness of Newton's mechanical world not influenced Smith and had the chaotic view, now popular in physics, prevailed at Smith's time, the methodology of economics might have been quite different. Therefore history matters! Or, stated differently, the current state of affairs is dependent on the path of history.

Historians were on the sideline for a long time; a non-appreciated position of course! Historians had lost the race for methodological dominance and needed to reckon that the adagium: 'if you cannot beat them join them' also holds in their case. They still kept their descriptive role but they also started testing theories on the basis of historical data.

David is an advocate for a role for history in economics for the following reasons. Passing events can cast their shadow over a long time and because these transient events might select one out of a multiple of potential equilibria. A lovely example of this so called path dependence is the history of the keyboard/typewriter (David, 1985). The question addressed is why the keys on the keyboard are arranged the way they are. The reason why they are arranged in a QWERTY-manner (see your keyboard) lies in history. In 1873 the (modern mechanical) typewriter is developed. Mechanics encountered the problem that quick typing caused the hammers to clash. The solution was to arrange the keys in such a way that typing was considerably slowed down. All producers, also those employing a deviating mechanical system, adapted to the QWERTY-system. Scale economies drove this adaption to the standard, as it is efficient to have a uniform system on a wide basis.

The technological need for the QWERTY system is long gone and other much more efficient schemes are available, so why not change? This is due to technological interrelatedness; the typewriter or keyboard (hardware) and the typists' skill (software) are interrelated and make it costly and hardly possible to change the system.

After the general picture of the position of historical economics, De Vries turned to a specific topic, namely the Dutch Republic.

2. The pre-industrial labour markets in the Netherlands

Before turning to the Dutch labour market some typical features of the British and French labour market will be illuminated. Wages in these markets were highly sticky, implying substantial up- and downward shifts in the living standard by changes in the price level. Skill premia remained very stable over time. And in the long run the Malthusian mechanism featured. This implied that (until the beginning of the industrial revolution) real wages increased if the population size decreased and vice versa.

The pre-industrial Dutch labour market did not look like this at all. Deviating features existed on the structure, the flexibility, and the level of wages. The structure differed in that the economy was much more organised; 40% of the population lived in cities and self employment was less common. The stickiness of wages was less severe, wages were adjusted to the cost of living and a 'secondary' payment was possible if the labour market was tense (in the summer for example). Furthermore a huge increase in labour supply occurred by increases in the length of the working day, in the number of working days per week (due to abolishment of feast-days) and a strong immigration flow. Still all this did not lead to a decrease in real wages. The explanation for this exceptional achievement in Holland is an investment-driven growth in the early Golden Age (making the Dutch republic the first to experience modern economic growth) combined with the flexible labour market. A huge part of the investments had an infrastructural character (canals, polder drainage, till 1650).

In later periods (18th century) the Dutch labour market had some peculiar characteristics (De Vries, 1994). Namely, it had the highest nominal wages in Europe, a substantial structural and seasonal unemployment existed, labour shortages in dirty industries were chronic and immigration occurred on a large scale.

This lasting disequilibrium in the labour market poses the question on the role of high wages in delaying industrialisation (a topic which we will encounter later again). It is obvious to connect this labour market inflexibility (with its high and sticky wages) to the late Dutch industrialisation.

Two aspects of successful industrialisation are (1) the generation and development of new technology and (2) the adoption of techniques that are already known (Mokyr (1991)). Mokyr is not eager to try to explain the level of technological creativity in a society but just to focuses on the adoption of known techniques.

The model Mokyr favours is a 'growing-up' model based on the following assumptions: technology is embodied in new capital, accumulation is based on the rate of profit (retained profits provide finance), wages are the main cost and goods are internationally mobile while labour is nationally (to a limited extent) mobile. The basic prediction is that high wages cause low profits, which in turn cause a very slow adoption of the new technology. For the Dutch economy this model clearly does a good job. One can also explain

Belgium's relatively early industrialisation with the model. Objections to the model are the counterexamples of Ireland, that combined low wages with a slow industrialisation and the relatively high wages in England. For Ireland several factors are important. The labour immobility assumption does not hold; the better skilled workers left the country. And secondly the effective labour costs were not low at all in Ireland due to low efficiency (low productivity due to some form of the efficiency wage consideration, this is not very clear to Mokyr, he is only able to exclude malnutrition). The opposite hold for England, the real labour costs Mokyr assesses to have been actually low, so *dear labour is cheap labour*.

3. Early financial markets

Supply and demand for money

Supply and demand for money in the Dutch republic, the next issue dealt with by De Vries, is an interesting one that also illuminates the creativity required by historians to gather their data.

Measuring money supply seems an easy task, as almost all the money had the form of coins. Thus the cumulated mint production would be a sufficient indicator. This measure is however not a good proxy as a lot of coins were exported to the East and there was a considerable inflow of coins from other countries. The alternative source where the historians tapped their data of, were the records on the inventories that were made up when people died. They found a money supply per capita in the Netherlands twice as high as in France. The growth in money supply was also tremendous in the Netherlands compared to England and France for 1540 to 1640. This is not surprising in light of the fact that this was the golden age for the Netherlands. What was surprising was the fact that this tremendous growth continued in the period of stagnation. Alongside these surprising findings from comparing the Netherlands with other countries, the fact that people had several times their salary in cash in their houses remains puzzling. This is especially in the light of Amsterdam being the financial centre of Europe. It was pleasant to experience that it can be very acceptable to say that: 'These questions are still unanswered' as De Vries did on some occasions (for example with respect to the question on the enormous cash-holdings).

On public debt

In the early period of the 17th century the ease of raising money for the government by issuing bonds was a source of success (recall that the infrastructural investments kept real wages high). The Dutch government was able to borrow at low interest rates due to low perceived risk. The low perceived risk was a consequence of the composition of spending of

the Dutch government. They did *not* raise the money to finance a war, as for example the Spanish did. Obviously, in that case the debt default risk is higher.

After 1670 the former source of success turned into a source of immense difficulties. The stagnation of trade due to protectionist measures by France and the UK was accompanied by stagnation of population growth and deflation. A continuing war with France (1689-1714) completed the drastic changes that created a very unfavourable economic situation. Debt became a severe problem; the level was approximately one and a half times Dutch GNP whereas the debt-service amounted to 70% of tax income.

The obvious solutions, raising taxes or increasing the money supply were not feasible. The former is ineffective due to the already very high burden. The latter is not feasible as Amsterdam was the financial centre of Europe, a position that would be harmed by a reputation-loss due to an excessive money supply. No actual solution was found still by the time the Republic fell (1811). Thus, one of the driving forces for the enrichment of the Dutch became a major cause of the fall of the Republic.

On tulip speculation and the efficiency of financial markets

Though Professor De Vries hardly touched on the paper (= disliked it?) by Garber (1989), it is interesting reading that is worth to be discussed briefly. The famous bubble in the tulip prices, dubbed 'Tulipmania' is seriously investigated by Garber. Dutch tulip-bulb prices in 1634-37 seem an obvious example of speculative excess. Careful scrutiny of available data shows however that the extremely high prices for rare (c.q. new) varieties might be fully rational on the basis of the market fundamentals. As Garber explains: 'As the bulbs propagate, their price naturally falls with expanding supply; however, the original bulb owner's bulb stock increases. The discounted value of bulb sales can easily justify extremely high prices for the unique bulb of a new variety' (p. 556). This is a pattern that reappears in the tulip bulb market again and again (a similar feature appears in the hyacinth bulb market). Still in modern times this pattern is normal. The only piece of the story that seems to reflect some market irrationality (The psychological explanations for the group dynamics of self-fulfilment will not be discussed) is the extraordinary rise in the prices of common bulbs. Garber's explanation for this is the fact that non-specialists entered the forward-market for bulbs. They were: 'a collection of people without net worth making ever-increasing numbers of 'million-dollar bets' with each other, with some knowledge that the state would not enforce the contracts' (p. 557). Thus the weak institutions surrounding the forward-market for tulip bulbs caused some (in Garber's opinion, harmless) speculation. For the remainder this financial market did behave surprisingly well.

A second piece of evidence for the functioning of financial markets is the correlation that is found between stock markets in London and Amsterdam. Despite the fact that the

speed of the flow of information was rather low, actually it moved as quickly as people did, this correlation was high. Another well functioning financial market.

4. The industrial revolution: demand or supply driven?

An obviously interesting question for historical economist (actually for all economists) is that on the causes of the industrial revolution. *Why* the industrial revolution occurred, *why* it occurred *when* it occurred, *why* in *England* first, and *why* so late in the Netherlands? All these interesting questions were touched upon in the last two lectures.

The fourth lecture dealt with the causes of the industrial revolution. More precisely, the question addressed is on the importance of the role of demand in making possible the revolution. An important role is attributed to demand in the so-called Gilboy hypothesis: 'The factory could not become typical until demand had been extended...throughout the entire population to consume the products of large scale industry....In order that a shift in the demand schedule may occur, individuals must be able to buy more units of a commodity at the same price, or the same amount of the commodity at a higher price..... the entire schedule must shift upward, indicating a greater buying power.' (Gilboy, p. 122-126). This hypothesis is built on circular reasoning, as demand can only increase as supply can increase. Mokyr (1977) assesses all possible variations of the Gilboy hypothesis and rejects all these demand driven explanations. He considers demand increases driven by agricultural growth, expansion of foreign demand, population growth and under-utilized resources. All of these explanations are rejected; some do not withstand the scrutiny of a-priori reasoning while others are rejected by empirical tests. Mokyr concludes that 'The old schoolboy view of the industrial revolution as a 'wave of gadgets' may not be so far off the mark after all' (p. 1003).

De Vries is not happy at all with the total rejection of a role for demand. Two facts, too astonishing to ignore, makes one indeed reconsider the verdict. The first fact is that during the industrial revolution (1750-1815) real wages declined. This fact does not at all make a story for a demand driven revolution (it is surprising though to find it in a period where the a revolution takes place in economic life) but it is accompanied by a second fact. People seemed, despite declining real wages, to increase their standard of living? This is reflected in more imported luxuries and increased average wealth when people died. How can these facts be reconciled?

The key to answering this question lies in household decision making (De Vries, 1993). De Vries dubbed the mechanism of intensified working the 'industrious revolution' after Hayami and Ogasahara. Working intensified by: increases in participation, more effort, more working days per year, etc. This intensification was paralleled by a shift from self-production / self-consumption (a kind of autarky) to more production of marketable goods (thus specialisation combined with increased trade). For an explanation of this shift, a change

in the evaluation (taste, greater individualization?) of money income versus leisure income is necessary. This intensification of work could explain the phenomenon of increased wealth accumulation that accompanied the declining real wages. Thus without a technological supply side shock, earnings rose and made a technology driven revolution much easier; a role for demand!

5. The Industrial Revolution: a broad view

A rich palette of potential explanations for the driving forces of the industrial revolution exists. A brief overview of this palette will be given before we turn to a Dutch question: Why did the revolution not take place in the Netherlands?

One version of the story of the driving forces of the revolution might be dubbed as *social change*. A social or political change that altered the functioning of markets. Regulation (think of the guilds) was torn apart and replaced by a competitive system. This might have been a change making the revolution feasible.

Another approach that is not seen as a major explanation but as a marginally contributing effect is called the *organisational approach*. The move from a peasant society with individual craftsmen to large factories, made supervision of workers possible, simplified better pass through, and reduced the required circulating capital. This last point might need some explanation. When workers are not organised in one single factory but on distant locations, high stocks of goods in every phase of the production process are necessary, thus requiring tremendous circulating capital.

As stressed, these issues are merely prerequisites for the industrial revolutions. The *technological change* school asserts innovations and the adoption of innovations as the crucial locomotive for the revolution. In this school two lines of reasoning are popular. The first (Mokyr is a representative) asks the big questions: why, when and where technologies were adopted. The focus is on adoption, as the innovations applied in the British industry were mostly not of British origin. The questions are clear, the answers are not simple; a multiple of factors is important. Crafts, a representative of the second group, argues that small initial advantages are self locomotive. Thus, in his view the questions are on small issues. Anecdotal evidence favours Crafts story, as it is possible to stress that the production of cotton-textile, the steam engine, coal production, the machine tool industry and large-scale iron industries are greatly interrelated (*i.e.* one product needed the other and so on).

Another explanation is the relatively abundant *energy supplies* which were available at that time. Though energy supply might be a ceiling to the economy, it is hard to answer the question why the industrial revolution happened in England first, taking the energy supply as starting-point. The Netherlands had sufficient energy supply also.

The macroeconomic school, finally, argued that it takes quite a long time for a single fast growing sector to have considerable impact on the total economy. Re-estimation of the Dean and Cole per capita growth rates of national income by Harley and Crafts leads to a later marked acceleration of the growth rate. Thus in the early period of the industrial revolution the extent of the part the economy that experienced high growth was simply too small to have a strong overall impact on the economy. This also sheds light on the low growth of real wages (encountered earlier) in the early years of the revolution.

Having explained what features might have contributed to the beginning of the industrial revolution, the issue why the Netherlands did not industrialize despite its seemingly good starting-point, is remaining. The Dutch republic was, at the time the changes in available production techniques became available, already a modern economic society. It was a society based on its own technological complex, the combination of used techniques and applied organisational structures suitable for this technique. This, given the new available technologies, obsolete technological complex might have acted as a break on the adoption of the new complex. (Though De Vries did not mention it, the mechanism was formalised by Brezis, Krugman and Tsiddon (1993) under the name of leapfrogging.)

A microeconomic example might clarify how this mechanism will function in a macroeconomic setting. Dutch rail developed relatively late compared to other countries. A potential explanation is the highly developed transport system of 'trekvaarten.' The availability of this alternative transportation mechanism would imply very low fares for the new rail roads, in order to be competitive. This implied low profitability of the rail roads made the exploitation of the system very unattractive, implying a very late adoption of the new way of organising transport. Translate this to the whole economy too see how being very good in the old technological complex implies a comparative disadvantage for the new technological complex. This might have delayed the Dutch industrialisation substantially.

References

- Brezis, E.S., P.R. Krugman and D. Tsiddon, "Leapfrogging in international competition: A theory of cycles in national technological leadership," *American Economic Review*, 1993, 1211-1219.
- David, P.A. (1985): "Clio and the Economics of QWERTY", *American Economic Review*, 75, 332-337.
- David, P.A. (1993): "Historical Economics in the Longrun: Some Implications of Path-Dependence", in G.D. Snooks (ed.), *Historical Analysis in Economics*, London.
- Gilboy, E.W., "Demand as a Factor in the Industrial Revolutions," in A.H. Cole (eds.) *Facts and Factors in Economic History*, 1932.
- Knick Harley, C.(1993): "Reassessing the Industrial Revolution: A Macro View", in J. Mokyr (ed.), *The British Industrial Revolution; An Economic Perspective*, Westview Press, Boulder, Colorado.
- Mokyr, J. (1977): "Demand vs. Supply in the Industrial Revolution", *Journal of Economic History*, 37, 981-1008.

- Mokyr, J. (1991): "Dear Labor, Cheap Labor, and the Industrial Revolution", in P. Higonnet, D.S. Landes, and H. Rosovsky (eds.), *Favorites of Fortune*, Cambridge, Mass.
- Vries, J. de (1994): "How did Pre-Industrial Labour Markets Function?", in G. Grantham and M. MacKinnon, *Labour Market Evolution*, Routledge, Montreal.
- Vries, J. de (1993): "Between Purchasing Power and the World of Goods: Understanding the Household Economy in Early Modern Europe", in J. Brewer and R. Porter, *Consumption and the World of Goods*, Routledge, London.

David Romer

New Keynesian Theories of Fluctuations

Report by Iman van Lelyveld (KUN)

This is a report on the lectures given by professor David Romer for the NAKE-workshop held in Amsterdam from 3 through 7 June 1995. In the lectures Romer sketched the building blocks for a New-Keynesian view. In his view equilibria are fragile, fleeting things pushed around by a myriad of intrinsically harmless shocks. First he established that standard monopolistic competition models are insufficient to model such equilibria. Consequently he identifies what building blocks are needed and then he proceeded in explaining and examining a number of these blocks. The labour, the goods, and the credit market are included in the analysis.

Introduction

Three main questions have occupied macroeconomists: How do we explain - different - growth patterns, how do we explain unemployment and how do fluctuations in economic activity come about? Romer tries to find an answer to the last question. Although these fluctuations are not as fashionable at the moment, he finds them of importance for two reasons. Firstly, cycles are still interpreted wrongly around the world and secondly, fluctuations could explain shifts in the economy.

In his quest for the origins of cycles Romer starts off with two 'pseudo facts' that turn out to be really important in the analysis. The first is that fluctuations are not driven by readily identified facts and thus economies drift around. The second pseudo fact is that monetary disturbances lead to real fluctuations. Together these 'facts' describe an economy that is easily moved between equilibria by intrinsically innocent nominal shock. Based on these 'facts' Romer first rejects models that have an obvious, 'automatically' achieved equilibrium and proceeds in search of models that might give unstable or fragile equilibria.

The general story that emerges is as follows. The first attempt to come to more realistic models is to introduce monopolistic competition. Unfortunately the standard model with monopolistic competition has a relatively stable equilibrium. This is at odds with the assumed fragility of real world equilibria. Thus Romer identifies forces that might lead to more fragile models. Then he analyses a number of models that give a description of the labour, the goods and the credit market to see if these might lead to more fragility.

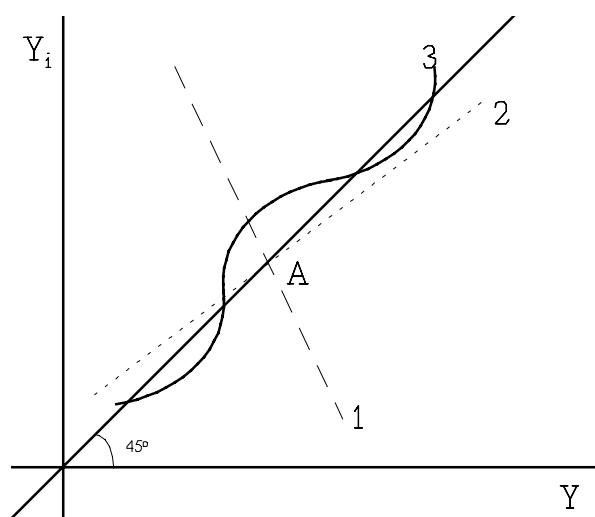
In this report I will first show that the introduction of monopolistic competition is not sufficient to generate a model with less stable solution. In the next section we

therefore have to identify those conditions that will make the solution less stable. Then I will discuss the various building blocks in the three markets. Finally, the concluding comments.

The First Step: Monopolistic Competition

What does the Romer-world look like? To sketch the world Romer uses a model by Cooper and John (1988), stressing 'The importance of strategic complementarities in agents payoff functions as a basis for macroeconomic coordination failures.'¹ In the model the payoff to an individual agent partly depends on other players' actions. It is a world with imperfect competition where the agents are not merely price takers. Figure 1 gives a number of possible reaction curves (RC) of agent i to the actions of the other agents.

Figure 1. Possible Reaction Curves



The horizontal axis gives the output of the economy as a whole, while the vertical axis gives the output a particular agent i would produce given Y . Since all agents are assumed to be identical, equilibrium occurs when the RC intersects with the 45° line. Thus point A is an equilibrium for RC's 1 and 2.

Curve number 1 gives the standard result. A stable equilibrium arises because a small positive shock to aggregate output, leads individual agents to reduce output. Since all agents are assumed to be identical this is the overall reaction and thus the economy quickly settles back into equilibrium.

However, the story is different for curves number 2 and 3. In both cases the economy will not automatically settle in *the* equilibrium following a shock to aggregate output.

¹Cooper and John (1988, p.441).

In the case of RC 2 a positive shock has the perverse result that each agent will want to increase his or her output. Thus the economy will not easily settle in a new equilibrium. Relatively small shocks have large effects on output. In the case of RC 3 there are multiple equilibria. A shock in this sort of economy might result in a higher or a lower -local- equilibrium outcome.

So far the model was kept decisively simple; The payoff functions were not specified. Therefore Romer works through a model which can be found in Chapter 6 of his book (Romer (1996)). After solving the model he derives a RC that is, after filling in reasonable values for the various parameters, downward sloping. This is very unfortunate since, as we see in Figure 1, this leads to a more or less stable economy.

What Do We Need for Steep Reaction Curves?

Since stable equilibria do not square with the first pseudo fact (i.e. economies wander around) Romer now looks at those aspects in the standard monopolistic competition model that would lead to steeper RC's. Figure 2 shows how such an economy might react to a fall in aggregate output from D_0 to D_2 .²

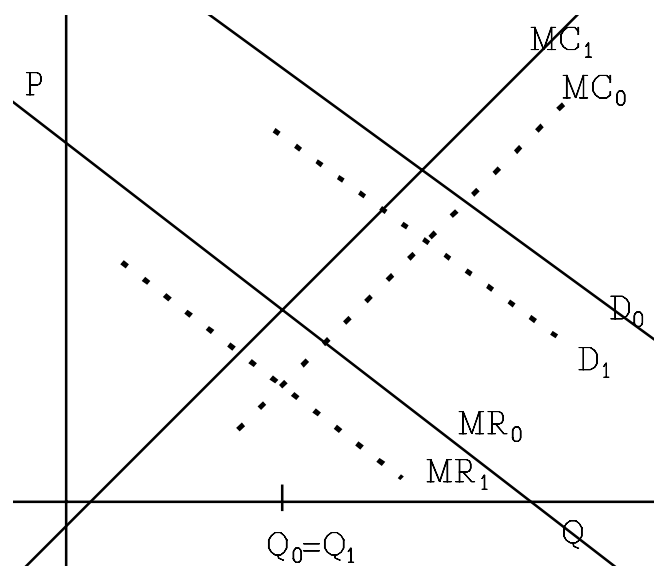


Figure 2. Demand shifts in the model

²See Romer (1996) Fig 6.3, p.279.

The question Romer bears in mind is the following: What, in such a model, would lead to a steeper reaction curve? He then distinguishes four cases which would make the RC steeper:

1. When marginal costs would be falling comparatively *less* then output when output falls.
2. When marginal revenue would be falling comparatively *more* then output when output falls.
3. When the marginal costs curve is flatter.
4. When the marginal revenue curve is flatter.

Having established what is needed for a steeper RC, Romer turns to the labour, the goods and the credit markets. In his analysis he is searching for models that might explain a steep RC.

The labour market

It is a generally accepted stylised fact that the real wage curve is relatively flat in time. However, Solon *et al* argue that 'the true pro-cyclicality is obscured in aggregate time series because of a composition bias'.³ This bias lies in the construction of the aggregate statistics which 'gives more weight to low-skill workers during expansions than during recessions.' Low-skilled workers get hired during a boom. Therefore the weight of low-earning, low-skilled workers increases in a boom flattening the rise of the real wage. The reverse happens during a bust.

If real wages are not really cyclical then the supply of labour has to be enormously flexible to achieve any kind of equilibrium. Romer does not find this plausible and implicitly assumes as his third 'pseudo fact' that labour supply is relatively inflexible. Combining the inflexible real wage and constant labour supply we can conclude that workers would have to be off their labour supply curve. Thus, according to Romer, we have to find explanations for workers being off their labour supply curve in a non-Walrasian setting. He gives three reasons.

³Solon, Barsky and Parker (1994, p.1).

1. Employees could maintain *long-run relationships* with their employers. Observed wages could then be set at non market clearing levels.
2. *Matching*: Jobs and workers could be in disequilibrium because both are heterogeneous. Workers could be waiting for the right job to come along or vice versa.
3. *Efficiency wages*: wages are not at the market clearing level in order to attract the 'good' workers.

Here Romer narrows down his analysis to the cyclical effects in the third argument. The model used in the analysis is a simple model with profit maximising firms with positive but diminishing marginal returns to production.⁴ Production depends on labour input and the degree of labour productivity, e . In turn, the degree of labour productivity depends on the wage. There are a number of arguments why productivity might depend on the wage. Among these are:

1. *A nutritional argument*. Especially in developing countries better fed workers might be more productive.
2. *Monitoring difficulties*. Shapiro and Stiglitz (1984) have argued that since it is difficult to measure the effort an employee exerts, a firm might gain by raising the stakes.
3. *Unobservable ability*. This is more or less a mismeasurement argument. If the wage seems to be 'off', there must be something else the firm is rationally paying for.
4. *Loyalty*. This argument, proposed by Akerlof and Yellen (1985), states that 'excess wages' are being paid to ensure that employees will be loyal.

Any or all of the above arguments could lead to above market clearing wage levels and unemployment occurring at the same time. Employers would not hire below the established wage level because they could not trust the new hands to work as hard or be as loyal. Two rather forced solutions for this problem are that the prospective employee posts a bond or pays an upfront fee for a job. The worker would lose these if he is caught shirking.

⁴See Romer (1996, Ch. 10, p.442 and further).

An alternative specification for labour productivity is one in which productivity not only depends on the wage but on the alternative wage and unemployment as well.⁵ The result of this adaptation is that the alternative wage is the floor in the market. Romer worked the model through with a specific functional form as well but this doesn't add much. The reader is referred to the book for a more extensive treatment.

The Goods Market

Next, we turned to the goods market. As was argued above, Romer is looking for mechanisms that lead to a steeper RC. One of these mechanisms works through a relatively more cyclical marginal revenue than output. Here the focus is on mark-ups. Romer gives three reasons why mark-ups would change counter-cyclically. Firstly, information is more important in a boom. Thus the outcome is closer to the competitive outcome with lower mark-ups. Secondly, a boom is *the* time to catch new customers. Finally, collusion is thought to be difficult to sustain in a boom. Note that price changes will be asymmetric because of asymmetric information. A price change is immediately revealed to the current clientele but has to be communicated to other agents. Thus price changes are not as easily implemented.

Romer also presented an article by Basu (1995) which shows a model focusing on intermediate inputs. Basu argues that mark-ups are less cyclical than output when intermediate goods become more important. This is due to an 'inaction multiplier' that is increasing with the number of firms in the input-output model. In effect it means that everyone is waiting for the others to move.

The Credit Markets

Finally Romer discussed the credit markets using two models. The first model is by Chevalier and Scharfstein (1994). The central tenet of this model is that, because of credit market imperfections, 'liquidity constrained firms try to boost short-run profits by raising prices to cut their investment in market share.'

The model has two-periods. In the first period the firm decides what price to charge. A low price in the first period will lead to more sales in the second period. In the presence of borrowing and the possibility of bankruptcy before the second period, the derived optimal price in the first period is a decreasing function of the probability of a boom. This is due to the trade-off between the certain profit now and the uncertain but positive profit in the second period.

⁵See Romer (1996) Ch. 10, p.446 and further.

The second model we used to describe the credit market is a model by Kiyotaki and Moore (1995). In this model output shocks work through two channels on the behaviour of credit constrained firms. The first channel is relatively straightforward. A temporary negative shock leads to a fall in the net worth of the firm. This leads the firm to demand less assets, leading to declining user cost of assets. The resulting fall in asset price is a negative feedback through the negative effect it has on the net worth of the firm. The second channel is more involved. The falling demand for assets feeds back into the net worth of the firm in the *next* period and in all future periods to come. Thus credit market imperfections magnify shocks.

Concluding Remarks

Let us recapitulate. The goal of the quest is to find a model with fragile equilibria. First we established that a model with monopolistic competition is not enough. Thus we deduced what is generally needed for such equilibria to appear. Then we analysed models of the labour, the goods and the credit markets to see if we could find mechanism that would lead to more fragility.

Initially I was filled with a sense of awe. Romer's story rang so true. All the different aspects highlighted seemed to fit together. However as I was writing this report I found it increasingly difficult to fit the presented 'pieces of the puzzle' together. Take for instance the treatment of the credit markets. The theme is credit constraints. In the model by Chevalier and Scharfstein booms lead to procyclical price setting, while Kiyotaki and Moore's model shows that credit constraints lead to magnification of booms and busts. Both models show aspects of the Romer-world. However, I find it difficult to mesh the two together.

However, the lectures by Romer have shown me that I still have a long way to go in exorcising the Walrasian demon. Since the New Keynesian vein seems to be a promising one I will keep trying.

References

- Akerlof, George A. and Janet L. Yellen, 1985, A Near-Rational Model of the Business Cycle, with Wage and Price Inertia, *Quarterly Journal of Economics* Vol.100, 823-838.
- Basu, Susanto, 1995, Intermediate goods and business cycles: implications for productivity and welfare, *American Economic Review* Vol.85, 512-531.
- Chevalier, Judith A. and David S. Scharfstein, 1994, Capital market imperfections and countercyclical markups: theory and evidence, NBER-Working Paper Nr. 4614.
- Cooper, Russell and Andrew John, 1988, Coordinating coordination failures in Keynesian models, *Quarterly Journal of Economics* Vol.103, 441-463.
- Kiyotaki, Nobuhiro and John Moore, 1995, Credit cycles, NBER-Working Paper Nr. 5083.
- Romer, David, 1996, *Advanced Macroeconomics*, McGraw-Hill, New York.

- Shapiro, Carl and Joseph E. Stiglitz, 1984, Equilibrium unemployment as a worker discipline device, *American Economic Review* Vol.74, 433-443.
- Solon, Gary, Robert Barsky and Jonathan A. Parker, 1994, Measuring the cyclicity of real wages: how important is composition bias, *Quarterly Journal of Economics* Vol.109, 1-25.

David Hendry

Forecasting in Non-Stationary Processes

Report by Xander Tieman (VU)

1. Introduction

David Hendry starts his lecture series by telling us that although the Dutch translations of the two words are not distinct, in English forecasting is not the same as predicting. He also stresses for the first time that predicting is something totally different than explaining. Predictions are not invariant to intertemporal transforms, e.g. doing a prediction of the level of stock prices is not hard, while predicting the change in stock prices is impossible. Therefore one should not judge models by their predictions. Later this turns out to be an important point in his lectures, since he stresses this point over and over again.

Hendry will lecture about what he calls ‘tricks to correct models for better predictions.’ The main issues will be intercept corrections and the new theory of co-breaking. Hendry will argue that Box & Jenkins methods work so well because they are just a clever way to incorporate intercept corrections into models.

Hendry starts by defining some concepts he will use. A forecast is a statement about a future event. A model is a representation of empirical phenomena and the mechanism is the process which actually generates the outcomes. The term mechanism is interchangeable with the term ‘data generation process’ (DGP). There are three situations we will take a look at:

- The model does not coincide with the mechanism.
- The DGP is not time invariant. It changes either in a rather smooth evolutionary way or with shocks due to regime changes.
- The form and parameters of the ‘best’ model are unknown.

Of these, the third situation will turn out not to be as important as the first two. This is in contrast with what is usually believed in econometrics. A lot of effort goes into the better estimation of parameters or the better specification of the model. Obviously Hendry’s view can change the way econometrics is conducted in an important way.

Hendry first mentions some alternative methods of forecasting and the requirements for them to work.

<i>Alternative</i>	<i>Requirement to work</i>
Guess	Luck
Extrapolating	Persistence
Leading Indicators	Consistency
Surveys of Plans	Implementation of Plans
Time-Series Model	Regularity

All these alternatives lack an economic framework and the accumulation of knowledge is not implemented in them.

2. Success and Failure of Methods

2.1. Unpredictability

First the concept of unpredictability (and therefore predictability) is introduced. A process v_t is unpredictable with respect to the information set I_{t-1} if the probability density function $D_v(v_t|I_{t-1})=D_v(v_t) \forall t$. A process v_t is unpredictable in mean if $E(v_t|I_{t-1})=E(v_t) \forall t$ and it is unpredictable in variance if $V(v_t|I_{t-1})=V(v_t) \forall t$. Unpredictability is invariant under non-singular contemporaneous transforms and is equivalent to statistical independence of v_t from I_{t-1} . Intertemporal transforms will affect unpredictability. Note that unpredictability is relative to the information set used.

For a process to be predictable, the ‘causes’ must already be in the information set. This need not be direct causes. The conclusion Hendry draws from this is that structure is not necessary for forecasting as long as the relevant I_{t-1} is known.

2.2. Forecastability

Forecastability is a process, using predictability amongst other things. This is the creating of systematic functions of I_{t-1} that give you forecasts. For this to work the predictability must be systematic, which is to say that the density function $D(\cdot)$ is constant. Also the proposed method must capture the predictability, so knowledge of at least part of I_{t-1} is necessary. However these methods often do not capture irregularities that swamp the predictability. It is indeed very difficult to rule out irregularities.

In an integrated process new, unpredictable components enter in each period, so $V(X_{T+h}|I_T)$ is non-decreasing in h , possibly non-monotonic. Uncertainty therefore does not decrease with the forecast horizon.

A particular implication of this that it is impossible to prove that you need genuinely relevant information for forecasting. It is possible to show that ‘irrelevant (non-causal)’ variables can be the best available forecasting devices in the absence of

omniscience. Moreover since intertemporal transforms affect predictability and predictability is necessary for forecastability, it is impossible to devise unique measures of forecast accuracy. All forecast measures should always be evaluated with respect to the goals they are devised for. However, it is easy to show that there exist bad forecast measures, e.g. the Minimum Mean Square Forecast Estimator (MSFE) is a bad forecast measure for a linear model, since the model does not alter with a linear transform, but the MSFE does.

2.3. Causal Information

Hendry distinguishes four salient cases with respect to the role of causal information:

1. The mechanism is constant over time and the model coincides with it.
2. The mechanism is non-constant over time and the model still coincides with it.
3. The mechanism is constant over time but the model does not coincide with it.
4. The mechanism is non-constant over time and the model does not coincide with it.

In the first three cases here it can be shown that causal information is helpful. It allows you to improve your forecast. However, in the fourth case no such result can be proved. It is here that non-causal variables can be better forecasting devices than causal variables.

In economics research it is very often the case that the model does not coincide with the mechanism. If on top of that there are regime shifts and breaks in the period under consideration, the mechanism is not constant and we end up in case 4. It is this case most econometricians have avoided and that has David Hendry's special attention. He is developing a theory of co-breaking, which to a considerable extent eliminates the impact of regime shifts and breaks.

3. The Models

3.1. The 1-step Model

Consider the time-series

$$x_t = dx_{t-1} + \varepsilon_t, \quad \varepsilon_t \sim \text{IN}(0, \sigma^2).$$

The estimate of x_{T+1} given x_T would then be $\hat{x}_{T+1} = \hat{d}x_T$ as $E(\varepsilon_{T+1}|x_T) = 0$. The expected error is equal to

$$\hat{e}_{T+1} = x_{T+1} - \hat{x}_{T+1} = (d - \hat{d})x_T + \varepsilon_{T+1}.$$

The first term here is the parameter uncertainty factor and the second term is the error accumulation factor. Since this method is independent of units, you can rescale σ to be 1.

This is a closed model, since as the number of observations $n \rightarrow \infty$ the forecast behavior will be determined by ε alone, because the $V(d - \hat{d}) \rightarrow 0$ and $V(\varepsilon)$ obviously stays equal to 1. Furthermore \hat{e} is essentially unbiased, even though \hat{d} is not. This can be seen when one draws an ε_T series, takes the equally likely opposite series $-\varepsilon_T$ and averages both series. The factor $(d - \hat{d})x_T$ cancels out and therefore the \hat{e} is unbiased.

Note that knowledge of x_T when forecasting x_{T+1} is quite a substantial assumption, which is not met a lot of the time. Further note that in this model when ε is small, one will obtain good estimates, even when \hat{d} is not so good and that one will get bad estimates when ε is large, even when \hat{d} is very good.

3.2. The Multi-step Model

We now consider a model to predict h periods ahead

$$x_{t+h} = d^h x_t + \sum_{j=1}^{h-1} d^j \varepsilon_{t+h-j}, \quad \varepsilon_t \sim \text{IN}(0, \sigma^2).$$

The estimator for x_{T+h} given x_T is now $\hat{x}_{T+h} = \hat{d}^h x_T$ and the expected error term again consists of an error accumulation factor and a parameter uncertainty factor. The variance of the expected error equals

$$V(\hat{e}_{T+h}|x_T) \approx \sigma^2 \sum_{j=0}^{h-1} d^{2j} + [hd^{n-1}]^2 x_T^2 \left(\frac{1-d^2}{T} \right)$$

For $d < 1$ the parameter uncertainty factor $d^h - \hat{d}^h$ will go to 0, so forecasts should be good in the long run. Taking the limit for $h \rightarrow \infty$ and $d < 1$ results in

$$\lim_{h \rightarrow \infty} V(\hat{e}_{T+h}|x_T) \approx \sigma^2 \frac{1-d^{2h}}{1-d^2} + \frac{\partial d^h}{\partial d} x_T^2 V(\hat{d}),$$

where the factor $\partial d^h / \partial d$ is not necessarily monotonic. This can result in very bad estimates indeed, with uncertainty larger than the uncertainty would be if we just predict the long run mean! In that case the method is 'worse than useless'. A criterion to see if this is the case is looking if the t -value for $d=0$ is bigger than h^2+1 .

For $d > 1$ obviously the model is of no help and this is also the case when $d = 1$ and therefore $V(\hat{e}_{T+h} | x_T) = h\sigma^2 + V(\hat{d})x_T^2$.

3.3. Multi-Step Model with Parameter Change

Now consider the realistic event of a parameter change in the Data Generation Process, when we want to forecast h periods ahead. Let the DGP for the period $1 \rightarrow T$ be of the form

$$x_t = c_1 x_{t-1} + c_2 z_{t-1} + v_t, \quad v_t \sim \text{IN}(0, \sigma_v^2).$$

Now between time $T+h-1$ and $T+h$ a parameter change from c_1, c_2 to c_1^*, c_2^* happens and so the outcome of the process at time $T+h$ will be

$$x_{T+h} = c_1^* x_{T+h-1} + c_2^* z_{T+h-1} + v_{T+h}.$$

We have estimated this DGP with the model $x_t = dx_{t-1} + \varepsilon_t$, $\varepsilon_t \sim \text{IN}(0, \sigma_\varepsilon^2)$ and our forecast is $\hat{x}_{T+h} = \hat{d}x_T$. Thus we have an expected error

$$\hat{e}_{T+h} = c_1^* x_T - \hat{d}^h x_T + \sum_{j=0}^{h-1} (c_1^*)^j \eta_{T+h-j},$$

where the term η_{T+h-j} is the composite error. We can rewrite this as

$$\begin{aligned} \hat{e}_{T+h} \approx & \left[(c_1^*)^h - c_1^h \right] x_T + (c_1^h - d^h) x_T + (d^h - \hat{d}^h) x_T + d^h (x_T - \hat{x}_T) \\ & + \sum_{j=0}^{h-1} (c_1^*)^j \eta_{T+h-j} + \text{intercepts.} \end{aligned}$$

We label the separate terms 1 to 6 and make the following distinction. Term 1 is the expected error because of the parameter change (the structural break). Term 2 is the model mis-specification term. Term 3 is the estimation uncertainty. Term 4 represents the initial condition mis-measurement, term 5 is the error explosion term and term 6 is the change in deterministic factors. As argued above, in general the factors 1 and 2 will be large compared to factor 3. One should use surveys to reduce factor 4. One of the key statements of Hendry's immediately follows from this rewriting, namely that if x_T is approximately equal to 0, the factors 1, 2 and 3 disappear. This is exactly why method like Box & Jenkins ARIMA models work so well. In lagged models the variable $x_T \rightarrow 0$, and so the factors 1, 2 and 3 of the expected error all become approximately equal to 0.

The science of econometrics tries to minimize the factors 1 to 5, but factor 6 has not been addressed a lot yet. This is what Hendry & Clements (1994b) do in their paper on intercept corrections.

4. Improving the Models

4.1. Intercept Corrections

Both intercept corrections and differencing data are methods often used in practice to adjust model forecasts to allow for anticipated future events. One specific way of intercept correcting is the adding of the residual of the current period to the next period's forecast value for 1-step ahead forecasts. This results in a forecast error of $e_{t,T+1}$ which is equal to the difference of the forecasts errors in the model without intercept correction Δe_{T+1} . Therefore the costs of intercept correcting are considerable, since the difference of the errors has a variance twice as big as the normal error term. Long ahead forecasts will explode.

In contrast, differencing the data has costs that are made once, namely at the time the actual differencing is done. It works over the remaining period.

4.2. Co-breaking

Co-breaking is a new term Hendry invented to describe the method to forecast well after the occurrence of structural breaks or regime shifts (parameter changes). The concept of co-breaking considers conditions under which regime shifts vanish for linear combinations of variables, which thereby do not depend on the breaks. The concept of co-breaking is therefore similar to that of cointegration in that linear combinations of series cancel out certain effects. It is distinct from cointegration because it focuses specifically on structural breaks. This concept can be implemented in econometric models in a way analogous to cointegration. There are two major kinds of co-breaking: intercept co-breaking and drift co-breaking. When two series are both intercept and drift co-breaking they can be used in econometric models quite well. Hendry proves that it is possible to find linear combinations that do not get affected by changes either in the mean or in the drift parameter. These combinations are therefore intercept and drift co-breaking.

Co-breaking between variables may arise accidentally, but when many breaks are observed in a series and co-breaking with another series is still possible, it seems very likely that the relationship between the series is genuine. When using co-breaking a distinction between (leading) indicators that are non-causal and causal relationships in econometric models is easily made. The former will not experience the same shifts as the target all the time and the latter is far more likely to do just that. Clements & Hendry strongly suspect that the absence of co-breaking is the main reason for predictive failure in indicators that lack causal relation to the target. Therefore they plead for the usage of econometric models in which their co-breaking theory is implemented.

References

- M.P. Clements & D.F. Hendry (1993): On the Limitations of Comparing Mean Square Forecast Errors. *Journal of Forecasting*, 12, 617-637.
- M.P. Clements & D.F. Hendry (1994): Towards a Theory of Economic Forecasting. In C. Hargreaves (ed.), *Non-stationary Time-series Analyses and Cointegration*, 9-52. Oxford University Press.
- M.P. Clements & D.F. Hendry (1995): Forecasting in Macro-economics. In D. Cox, D. Hinkley & O. Barndorff-Nielsen (eds.), *Time Series Models*, 99-138. Chapman & Hall London.
- D.F. Hendry & M.P. Clements (1994a): Can Econometrics Improve Economic Forecasting?. *Swiss Journal of Economics and Statistics*, 130, 267-298.
- D.F. Hendry & M.P. Clements (1994b): On a Theory of Intercept Corrections in Macro-economic Forecasting. In S. Holly (ed.), *Money, Inflation and Employment: Essays in Honour of James Ball*, 160-182. Edward Elgar Aldershot.

The following article was taken from FAUSA News, a news letter put out by a union for university teaching staff in Australia. The editors of FAUSA News had themselves reprinted the article from the Canadian Association of University Teachers' Bulletin. A photocopy of this article was on my door for a number of years, both in Tasmania and in Melbourne, and attracted quite a few laughs from passing students and staff members. I recently found a copy and now want to pass it on to you. Basically, the author, who teaches at McMaster University in Canada, has collected all the bloopers that he has found in various student essays and collated them into an historical essay which is almost right. Hence, the expression 'quite good but no cigar' in the header. Perhaps NAKE Nieuws readers feel tempted to submit a similar contributions based on their own experience in teaching in economics? [BJH]

A history of the past, when 'life reeked with joy'

by Anders Henriksson

From *The Wilson Quarterly*, Spring 1983. Copyright 1983 by The Woodrow Wilson International Center for Scholars.

History, as we know, is always bias, because human beings have to be studied by other human beings, not by independent observers of another species.

During the Middle Ages, everybody was middle-aged. Church and state were co-operatic. Middle Evil society was made up of monks, lords and surfs. It is unfortunate that we do not have a medieval European laid out on a table before us, ready for dissection. After a revival of infantile commerce slowly creeped into Europe, merchants appeared. Some were sitters and some were drifters. They roamed from town to town exposing themselves and organised big fairies in the countryside. Medieval people were violent. Murder during this period was nothing. Everybody killed someone. England fought numerously for land in France and ended up winning and losing. The Crusades were a series of military expeditions made by Christians seeking to free the holy land (the "Home Town" of Christ) from the Islams.

The Middle Ages slimpared to a halt. The renasence bolted in from the blue. Life reeked with joy. Italy became robust, and more individuals felt the value of their human being. Italy, of course, was much closer to the rest of the world, thanks to northern Europe. Man was determined to civilize himself and his brothers, even if heads had to roll!

The Reformnation happened when German nobles resented the idea that tithes were going to Papal France or the Pope thus enriching Catholic coiffures. Traditions had become

oppressive so they too were crushed in the wake of man's quest for resurrection above the not-just-social beast he had become. An angry Martin Luther nailed 95 theocrats to a church door. Theologically, Luther was into reorientation mutation.

Louis XIV became King of the Sun. He gave the people food and artillery. If he didn't like someone, he sent them to the gallows to row for the rest of their lives. Vauban was the royal minister of flirtation.

The enlightenment was a reasonable time. Voltare wrote a book called *Candy* that got him into trouble with Frederick the Great. Philosophers were unknown yet, and the fundamental stake was one of religious toleration slightly confused with defeatism. France was in a very serious state. Taxation was a great drain on the state budget. The French revolution was accomplished before it happened. The revolution evolved through monarchical, republican and tolarian phases until it catapulted into Napoleon. Napoleon was ill with bladder problems and was very tense and unrestrained.

History, a record of things left behind by past generations, started in 1815. Throughout the comparatively radical years 1815-1870 the western European continent was undergoing a Rampant period of economic modification.

A new time zone of national unification roared over the horizon. Founder of the new Italy was Cavour, an intelligent Sardine from the north. Nationalism aided Italy because nationalism is the growth of an army. We can see that nationalism succeeded for Italy because of France's big army. Napoleon III-IV mounted the French thrown. One thinks of Napoleon as a live extension of the late, but great, Napoleon. Here too was the new Germany: loud, bold, vulgar and full of reality.

Culture fomented from Europe's tip to its top. Richard Strauss, who was violent but methodical like his wife made him, plunged into vicious and perverse plays. Dramatized were adventures in seduction and abortion. Music reeked with reality. Wagner was master of music, and people did not forget his contribution. When he died they labeled his seat "historical".

World War I broke out around 1912-14. Germany was on one side of France and Russia was on the other. At war people get killed, and then they aren't people any more, but friends. Peace was proclaimed at Versigh, which was attended by George Loid, Primal Minister of England. President Wilson arrived with 14 pointers. In 1937 Lenin revolted Russia. Communism reaged among the peasants, and the civil war "team colours" were red and white.

Germany was displaced after WWI. This gave rise to Hitler. Germany was morbidly overexcited and unbalanced. Berlin became the decadent capital, where all forms of sexual deprivations were practised. A huge anti-semantic movement arose. Hitler remilitarized the Rineland over a squirmish between Germany and France. The appeasers were blinded by

the great red of the Soviets. Moosealini rested his foundations on eight million bayonets and invaded Hi Lee Salasy, Germany invaded Poland, France invaded Belgium, and Russia invaded everybody. War screeched to an end when a nukuleer explosion was dropped on Hiroshima. A whole generation had been wipe out in two world wars, and their forlorne families were left to pick up the pieces.

According to Fromm, individuation began historically in medieval times. There is increasing experience as adolescence experiences its life development. The last stage is us.

NEW AIO'S/OIO'S

Drs. D.P.J. (Dennis) BOTMAN (UVA)

Begeleiders: Prof.dr. H. Jager

Onderwerp: Exchange rate policy for developing countries

Mr. B.J. (Bernard) CONLON (KUB)

Begeleiders: Prof.dr. J. Magnus

Onderwerp: Econometrics

Ir. J.A.M.M. (Jørgen) GEURTS (LUW)

Begeleiders: Prof.dr.ir. A. Oskam & Prof.dr. A. Dijkhuizen

Onderwerp: The management and organization of animal disease control at European level

Ir. C. (Koos) GARDEBROEK (LUW)

Begeleiders: Prof.dr.ir. A. Oskam & dr.ir. J.H.M. Peerlings

Onderwerp: Farm-specific decisions on quasi-fixed inputs and their impact on the effects of agricultural and environmental policies.

U. (Uri) GNEEZY (KUB)

Begeleiders: Prof.dr. E. van Damme

Onderwerp: Behavioral finance

X. (Xiaodong) GONG (KUB)

Begeleiders: Prof.dr. A. van Soest

Onderwerp: Labour supply

L. (Louise) GROGAN (UVA)

Begeleiders: Prof.dr. S. Gustafsson

Onderwerp: Labour force participation of older women and men in Eastern Europe

Drs. P.J.G. (Peter) HEIJMANS (RUG)

Begeleiders: Prof.dr. P. Kooreman & Prof.dr. F. de Kam

Onderwerp: Dynamics of income, tax exemptions, consumption and welfare

Drs. A. (Albert) VAN DER HORST (UVA)

Begeleiders: Prof.dr.W.H. Buiters & Prof.dr. B.J. Heijdra

Onderwerp: The public finance of intergenerational accounting

Drs. R. (Roelof) DE JONG (RUG)

Begeleiders: Prof.dr. A. Nentjes & Dr. D. Wiersma

Onderwerp: Allocative and X-efficiency in the provision of environmental services

Drs. B. (Bas) VAN DER KLAUW (VU)

Begeleiders: Prof.dr. G. van den Berg & Prof.dr. J. van Ours

Onderwerp: Labour economics

Drs. T. (Thijs) KNAAP (RUG)

Begeleiders: Prof.dr.mr. C.J. Jepma & Prof.dr. S. Kuipers

Onderwerp: Lasting gaps: Amending models of endogenous growth with economies of scale

Drs. U. (Udo) KOCK (VU)

Begeleiders: Prof.dr. F.A.G. den Butter

Onderwerp: Social security and the flow approach: An empirical analysis for the Netherlands

Drs. J.M.M. (Mirjam) KOSTER (RUG)

Begeleiders: Prof.dr. A. Nentjes & Dr. D. Wiersma

Onderwerp: Public companies in the market for environmental permits

Drs. M.P. (María Pilar) MONTERO GARCÍA (KUB)

Begeleiders: Prof.dr. E. van Damme

Onderwerp: Competition and quality: The role of coalitions

Ir. M.S. (Maria) NIJNIK (LUW)

Begeleiders: Prof.dr.ir. A. Oskam

Onderwerp: Sustainability in the forestry sector

V. (Victoria) SHESTALOVA (KUB), M.A.

Begeleiders: Dr. Th. Ten Raa

Onderwerp: A microeconomic foundation to the macroeconomic demand function

Drs. B.C. (Bert) SMID (RUG)

Begeleiders: Dr. H.W.A. Dietzenbacher, Prof.dr. E. Sterken & Prof.dr. P. Kooreman

Onderwerp: The construction and evaluation of an econometric input-output model for the Netherlands

Drs. B.S.I. (Bjørn) VOLKERINK (RUG)

Begeleiders: Prof.dr. J. de Haan & Prof.dr. C.A. de Kam

Onderwerp: The political economy of fiscal policy

NAKE DIPLOMAS JUNE WORKSHOP

Bas van Aarle (KUB)

Talitha Feenstra (KUB)

Pieter Gautier (VU)

Noud van Giersbergen (UVA)

Pierre Koning (VU)

Erwin Bulte (LUW)

DISSERTATIONS COMPLETED

Dr. P.W.J. (Paul) de Bijl (KUB)

Essays in Industrial Organisation and Management Science

26 April 1996

Dr. J. (Jan) Bouckaert (KUB)

Essays in Competition with Product Differentiation and Bargaining in Markets

21 June 1996

Dr. D.R. (Dennis) Dannenburg (UVA)

Basic Actuarial Credibility Models: Evaluations and Extensions

3 June 1996

Dr. S. (Simone) Dobbelsteen (LUW)

Intrahousehold Allocation of Resources; A Microeconomic Analysis

6 September 1996

Dr. H.M. (Harry) Webers (KUB)

Competition in Spatial Location Models

10 June 1996

NAKE Teaching Programma 1996-1997
Blocks III and IV

Block III: 31 January - 7 March

- 96.22. 10.00 - 12.00 Topics in Applied Microeconomics: Deregulation. van Damme & Gradus.
- 96.41. 10.00 - 12.00 History and Philosophy of Economic Models. Morgan.
- 96.3A. 12.30 - 14.30 Economic Growth and Development: Macroeconomics. van Ewijk & van Wijnbergen.
- 96.01. 12.30 - 14.30 Applied Labour Economics. van den Berg, den Butter, van Ours.
- 96.36. 15.00 - 17.00 Economic Equilibrium under Price Restrictions. van der Laan & Talman.
- 96.35. 15.00 - 17.00 Intertemporal Choice. Kooreman & Kapteyn.

Block IV: 21 March - 2 May

- 96.23. 10.00 - 12.00 Econometric Inference in Dynamic Models with Integrated Processes. van Dijk & Boswijk.
- 96.3B. 10.00 - 12.00 Economic Growth and Development: Development Economics. Gunning & Keyzer.
- 96.25. 12.30 - 14.30 Recent Developments in Nonlinear Time Series Analysis. de Gooijer & Franses.
- 96.01. 12.30 - 14.30 Applied Labour Economics. van den Berg, den Butter, van Ours.
- 96.65. 15.00 - 17.00 Applied General Equilibrium Analysis. Broer.

All course descriptions can be found on the NAKE Home Page:

http://www.fee.uva.nl/vak_groep/nake

REGISTRATION FORM UTRECHT COURSES

Block III and IV, 1997

Name:

Department:

University:

Address:

.....

Phone no.

Email

I will attend the following courses (please encircle):

Block III

1. van Damme & Gradus
2. Morgan
3. van Ewijk & van Wijnbergen
4. van den Berg, den Butter & van Ours
5. van der Laan & Talman
6. Kooreman & Kapteyn

Block IV

7. van Dijk & Boswijk
8. Gunning & Keyzer
9. de Gooijer & Franses
10. van den Berg, den Butter & van Ours
11. Broer

Please return this form as soon as possible (preferably before) to the NAKE secretary:

José Dijkzeul
Secretariaat NAKE
Universiteit van Amsterdam
Roetersstraat 11
1018 WB Amsterdam