IS THE QTM CONTROVERSY SETTLED?

N L Bhanumurthy
M Ramachandran
Purna Chandra Padhan

INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE
2001
Institute for Social and Economic Change (ISEC) is engaged in interdisciplinary research in analytical and applied areas of the social sciences, encompassing diverse aspects of development. ISEC works with central, state and local governments as well as international agencies by undertaking systematic studies of resource potential, identifying factors influencing growth and examining measures for reducing poverty. The thrust areas of research include state and local economic policies, issues relating to sociological and demographic transition, environmental issues and fiscal, administrative and political decentralization and governance. It pursues fruitful contacts with other institutions and scholars devoted to social science research through collaborative research programmes, seminars, etc.

The Working Paper Series provides an opportunity for ISEC visiting fellows and PhD scholars to discuss their ideas and research before publication and to get feedback from their peers. Papers selected for publication in the series present empirical analysis and generally deal with wider issues of public policy at a sectoral, regional or national level. These working papers undergo review but typically do not present full research results, and constitute works in progress.
IS THE QTM CONTROVERSY SETTLED?

N R Bhanumurthy
M Ramachandran
Purna Chandra Padhan

Abstract

The present study tests the validity of the Quantity Theory of Money with the help of a new test procedure developed by Horvath & Watson (Econometric Theory, 1995) in a multiple cointegration framework. By using a fairly long quarterly data set of USA, Canada, Australia and Italy for the period 1975-I to 1998-II the study found that I(0) velocity is proved in all the sample countries, except Canada. Further, it found that all the sample countries have at least one unknown cointegrating vector between money supply, prices and real income, corroborating the propositions of QTM.

JEL classification: C32, E41

Key Words: Quantity theory of money, Multiple Cointegration

One of the oldest and most controversial theories in economics is the quantity theory of money (QTM). The theory, which was first formulated by Fisher, postulates that there exists a strong positive causal relationship from money supply to the domestic price level given that the velocity of circulation and volume of trade remain unchanged over a period of time. In its original version it has taken the form of an identity or the equation of exchange as MV=PT. This identity explains that the quantity of money (M) times the

* This work was done when the first author was UGC Visiting Fellow to University of Mumbai, Mumbai. The authors would like to thank Prof Mark Watson and G. Mini for their encouragement in completing this paper. Any errors and omissions in the paper are the authors'.

** a Research Associate, Institute of Economic Growth, University Enclave, Delhi - 110 001, India.
   E-mail: bhanu@ieg.ernet.in

b Associate Professor, Madras School of Economics, Chennai.

c Research Student, Department of Economics, University of Hyderabad, Hyderabad - 500 046.
transaction velocity of circulation of money will be equal to the volume of physical transaction (T) multiplied by the average price level in the economy. Over a period of time this QTM has taken different shapes under the Cambridge group (which replaced the volume of transaction (T) with real income (Y)), and Milton Friedman. But the basic propositions of the QTM remain unchanged. They are, given the velocity of circulation of money as a stable function, a) an increase in the growth rate of money, other things remaining same, will have a strong positive impact on the price level, b) changes in money supply will not have any impact on the real income.

To test the QTM empirically it is sufficient if we show that, ceteris paribus, there exists a proportional relationship between money supply and prices. But this is the proposition in economic theory, with downward sloping demand curve being an exception, which is extensively tested in different economies under different conditions using various econometric techniques. But researchers have not arrived at a consensus. Since its existence in its recognisable form for more than two hundred years, the theory was criticised by different schools of thought. (For a more detailed discussion on the criticism of the QTM see Laidler (1989)).

In this context, the present study attempts to test the main propositions of QTM with the help of a new multiple cointegration procedure developed by Horvath & Watson (1995), which is statistically a better procedure than the existing Johansen & Juselius (1992). (The size and power of these two procedures were tested in Edison et. al. (1997). With the help of Monte Carlo experiments the study concluded that the Horvath & Watson procedure has more predictive power than the Johansen & Juselius). The study considers quarterly data of the United States, Italy, Australia and Canada for the period 1975-I to 1998-II. The data was collected from the various issues of International Monetary Fund's International Financial Statistics, and the definitions of the variables are country specific.

The next section synthesises the two multiple cointegration procedures, viz., Johansen & Juselius, and Horvath & Watson for the benefit of future research. The following sections cover the discussion of results, and conclusions are presented in the final section.
Methodology

It is established in the literature that most of the long series macro data will exhibit non-stationary trend. Hence, to establish the relationship between any macro variables one should follow the cointegration technique as traditional regression techniques that are based on classical assumptions will give spurious results when the series is non-stationary. Many studies followed cointegration techniques that are developed by Engle and Granger (1987), Johansen (1991), Johansen & Juselius (1992), and Stock & Watson (1993). With the help of univariate cointegration methods one cannot test the cointegration between more than two variables. To test the cointegration for more than two variables one should follow the structural procedures like multiple cointegration techniques developed by Johansen & Juselius.

The multiple cointegration procedure due to Johansen & Juselius (1992) is a two-step procedure that examines the null hypothesis of no cointegration against the alternative of cointegration in the first stage. If the null hypothesis is rejected then in the second stage the test examines the null hypothesis of the presence of cointegration derived from economic theory against the alternative hypothesis of the presence of an unknown cointegrating vector. But in the Horvath & Watson procedure, which is an improvement over the Johansen & Juselius procedure, null hypothesis of no cointegration is tested against the composite alternative hypothesis of cointegration using a prespecified cointegrating vector. For a better understanding of Horvath & Watson (1995) and its difference from Johansen & Juselius (1992), both these methods are discussed in detail.

Let $X_t$ be an $(n \times 1)$ data vector with a sample size $T$. Under the Johansen & Juselius procedure the hypothesis testing will be

$H_0$: Number of cointegrating vectors $r = h$, $0 \leq h < n$

$H_a$: Number of cointegrating vectors $r = n$

To test this hypothesis, we fit a VAR ($p$) model, which is represented as

$$
\Delta X_t = A_1 \Delta X_{t-1} + A_2 \Delta X_{t-2} + \ldots + A_{p-1} \Delta X_{t-p+1} + A_0 + \Pi X_{t-1} + \varepsilon_t, \quad \varepsilon_t \sim \text{NIID}(0, \Omega) \quad (1)
$$
Since $H_2$ specifies $r=h$, we may have some more linear combinations (variables) in the system that are $I(1)$. Hence, we can decompose \( \Pi \) matrix as

\[
\Pi = \alpha \beta^t
\]

(2)

where \( \alpha \) and \( \beta \) are $n \times h$ matrix. Here, we have to estimate \( (A_0, A_1, \ldots, A_{p-1}, \Pi, \Omega) \) through maximum likelihood procedures, such that \( \Pi \) can be written as in (2).

To estimate all these parameters, we have to follow two-step procedures.

In the first step, regress $\Delta X_t$ on $\Delta X_{t-1}, \ldots, \Delta X_{t-p+1}$ and obtain the residuals $u_t$.

In the second step, regress $X_{t-1}$ on $\Delta X_{t-1}, \Delta X_{t-2}, \ldots, \Delta X_{t-p+1}$ and obtain the residuals $\hat{e}_t$.

From the obtained residuals $\hat{u}_t$ and $\hat{e}_t$, find the variance-covariance matrices.

\[
\hat{\Sigma}_{uu} = (1/T) \sum_{t=1}^{T} \hat{u}_t \hat{u}_t^t
\]

(3)

\[
\hat{\Sigma}_{ee} = (1/T) \sum_{t=1}^{T} \hat{e}_t \hat{e}_t^t
\]

(4)

\[
\hat{\Sigma}_{ue} = (1/T) \sum_{t=1}^{T} \hat{u}_t \hat{e}_t^t
\]

(5)

With the help of (3) - (5), we can find the maximum likelihood estimator of \( \beta \) by solving the matrix.

\[
| \lambda \hat{\Sigma}_{ee} - \hat{\Sigma}_{ue} \text{INV}(\hat{\Sigma}_{uu}) \hat{\Sigma}_{ue} | = 0
\]

(6a)

With the eigen values $\hat{\lambda}_1 > \hat{\lambda}_2 > \ldots > \hat{\lambda}_n$ and the normalized cointegrating vectors

\[
\hat{\beta} = (\hat{\beta}_1, \hat{\beta}_2, \ldots, \hat{\beta}_n)
\]

such that $\hat{\beta} \hat{\Sigma}_{ee} \hat{\beta} = I$
Hence, the maximum likelihood estimator of \( \hat{\beta} \) will be

\[
\ell_{\text{max}} = |\Sigma_{\text{uu}}| \prod_{i=1}^{h} \log(1 - \lambda_i)
\]

To test the \( H_0 \), we use the likelihood ratio test as \( (L_{\alpha} - L_0) \) where

\[
L_0 = -\left( \frac{Tn}{2} \right) \log(2\Pi) - \left( \frac{Tn}{2} \right) - \left( \frac{T}{2} \right) \log |\Sigma_{\text{uu}}| \\
- \left( \frac{T}{2} \right) \sum_{i=1}^{h} \log(1 - \lambda_i)
\]

(6b)

and

\[
L_{\alpha} = -\left( \frac{Tn}{2} \right) \log(2\Pi) - \left( \frac{Tn}{2} \right) - \left( \frac{T}{2} \right) \log |\Sigma_{\text{uu}}| \\
- \left( \frac{T}{2} \right) \sum_{i=1}^{n} \log(1 - \lambda_i)
\]

(7)

Hence, \( L_{\alpha} - L_0 = -\left( \frac{T}{2} \right) \sum_{i=h+1}^{n} \log(1 - \lambda_i) \)

(8)

(8) follows \( 'X^2' \) distribution

Further, if the number of cointegrating vectors is found to be \( h \), then with the estimated \( '\beta' \) we can estimate the \( '\alpha' \) and \( '\Pi' \) as

\[
\hat{\alpha} = \hat{\Sigma}_{\text{ue}} \hat{\beta} (\hat{\Sigma}_{\text{ee}} \hat{\beta})^{-1}
\]

(9)

and

\[
\hat{\Pi} = \hat{\Sigma}_{\text{ue}} \hat{\Sigma}_{\text{ee}}^{-1}
\]

(10)

**Horvath & Watson Test**

This test is different from Johansen. In this model the test is carried out when some of the cointegrating vectors that are derived
from economic theory are prespecified. The hypothesis in this method that is different from the Johansen method, is

\[ H_0: \text{Number of cointegrating vectors will be } h_0, \text{ which consists of } h_{0k} + h_{0u}, \text{ and} \]

\[ H_a: \text{Number of cointegrating vectors will be } h_0 + h_1 \ (h_1 > 0) \text{ where } h_1 \text{ consists of } h_{1k} + h_{1u}. \]

Here 'k' and 'u' denote the known and unknown respectively.

Accordingly, we can also separate the long-run multiplier matrix \( \Pi = \alpha \beta' \) as

\[ \Pi = (\alpha_0, \alpha_1) (\beta_0, \beta_1)' \]

where \( \beta_0 \) is an \( n \times h_0 \) to be tested under null and \( \beta_1 \) is an \( n \times h_1 \) to be tested under alternative. Similarly, for \( \alpha_0 \) and \( \alpha_1 \).

Further, \( \beta_1 \) can be partitioned as \( (\beta_{1k}, \beta_{1u}) \) and \( \alpha_1 \) as \( (\alpha_{1k}, \alpha_{1u}) \)

Therefore, \( \Pi \chi \alpha = \alpha_0 (\beta_0' \chi_0) + \alpha_1 (\beta_1' \chi_1) \)

Therefore, the competing hypothesis will be

\[ H_0: \alpha_1 = 0 \]

\[ H_a: \alpha_1 \neq 0 \]

i.e., rank of \( (\alpha_1, \beta_1') = h_1 \)

To test the hypothesis, we have to construct the likelihood ratio statistic that depends on the value of \( \beta_{0k} \) and \( \beta_{1k} \) and also on \( h_{0k}, h_{1k}, h_{0uk} \) and \( h_{1uk} \).

The likelihood ratio statistic will be

\[ L_{\Pi_0, \Pi_1}(\beta_{0k}, \beta_{1k}) \]
when \( h_{ok} = 0 \), the statistic will be \( \text{LR}(0, \beta_{1k}) \) and when \( h_{1k} = 0 \), the statistic will be \( \text{LR}(\beta_{ok}, 0) \)

\[
L_{n0,0;1} (\beta_{ok}, \beta_{1k}) = \text{LR}_{0,0;+1} (0, [\beta_{ok}, \beta_{1k}]) - \text{LR}_{0,0} (0, \beta_{ok})
\]  

(11)

With the help of \( H_0 \) in this test (assume that \( h_0 = 0 \)) the model (1) can be written as

\[
\Delta x_t = \alpha_{1k} (\beta_{1k}' x_{t-1}) + \alpha_{1uk} (\beta_{1uk}' x_{t-1}) + \delta z_t + \varepsilon_t
\]

(12)

where \( \delta = (A_1, A_2, ..., A_{p-1}) \)

\( z_t = [x_{t-1}', x_{t-2}', ..., x_{t-p+1}]' \)

Here to test the null of \( h_0 = 0 \), we take the composite null such that

\( H_0: \alpha_{1k} = 0 \) and \( \alpha_{1uk} = 0 \).

This null has to be first tested separately and then the joint hypothesis can be tested. First test will be on \( H_0: h_0 = 0 \) against \( H_1: h_1 = h_{1k} \).

Hence, the equation (12) can be written as

\[
\Delta x_t = \alpha_{1k} (\beta_{1k}' x_{t-1}) + \delta z_t + \varepsilon_t
\]

(13)

(13) can be estimated with simple OLS and the OLS estimator of \( \alpha_{1k} \) will be

\[
\hat{\alpha}_{1k} = (\Delta x' M_{x,1} \beta_{1k})(\beta_{1k}' x_{1-1}' M_{x,1} x_{1-1} \beta_{1k})^{-1}
\]

(14)

where \( M_{x} = [I-Z(Z'Z)^{-1} Z'] \)

To test the \( H_0' \) the procedure uses Wald statistic that is equal to

\[
W = [\alpha_{1k}' ((\beta_{1k}' x_{1-1}' M_{x,1} x_{1-1} \beta_{1k})^{-1} \otimes \Sigma_{\varepsilon})^{-1} [\alpha_{1k}]
\]

(15)

with the degrees of freedom \( (N-h_{0uk}, h_{0k}, h_{1k}, h_{1uk}) \)

Where \( \Sigma_{\varepsilon} = T^{-1} \Sigma' \Sigma \)
**Second test:**

H₀: \( h_0 = 0 \) against the alternative of

H₁: \( h_1 = h_{1uk} \)

Hence, (12) will be written as

\[
\Delta x_t = \alpha_{1uk}(\beta'_{1uk} x_{t-1}) + \delta z_t + \epsilon_t
\]  

(16)

Same (15) cannot be used here as \( \beta'_{1uk} x_{t-1} \) depends on unknown parameters. We cannot use the OLS estimators to estimate the \( \alpha_{1uk} \). But we can estimate the Wald statistic as follows:

\[
\text{Sup } W = \sum_{i=1}^{h_{tot}} \hat{\lambda}_i (CC')
\]  

(17)

with the degrees of freedom \( (N-h_{0uk}, h_{0k}, h_{1k}, h_{1uk}) \)

Where \( CC' = [\Sigma_{\epsilon}^{-1/2} (\Delta X'M_{x} X_{k}) (X'_{-1} M_{z} X_{1})^{-1} (X'_{-1} M_{z} \Delta X) \Sigma_{\epsilon}^{-1/2}] \)  

(18)

And \( \hat{\lambda}_i \)'s are the eigen values of \( CC' \)

**Third test:**

This test is a composite one of the previous two tests which is the main hypothesis of the HW test. Here the null hypothesis of no cointegrating vectors is tested against the alternative of both unknown and unknown cointegrating vectors. That is

H₀: \( h_0 = 0 \) against

H₁: \( h_1 = h_{1k} + h_{1uk} \)

Therefore, the model will be same as (12)

\[
\Delta x_t = \alpha_{1k}(\beta'_{1k} x_{t-1}) + \alpha_{1uk}(\beta'_{1uk} x_{t-1}) + \delta z_t + \epsilon_t
\]

The Wald statistic for testing this hypothesis will be
\[ \text{\textsuperscript{Sup}} W = [\Delta \mathbf{X}' \mathbf{M}_{\beta_{1k}}] \left[ (\mathbf{X}'_{1k} \mathbf{M}_{x1} \mathbf{X}_{1k} \mathbf{M}_{x1} \mathbf{X}_{1k} \mathbf{M}_{x1} \mathbf{X}_{1k}) \right]^{-1} \]
\[ \otimes \Sigma_{x}^{-1} [\Delta \mathbf{X}' \mathbf{X}_{1k} \mathbf{M}_{1k}] + \sum_{i=1}^{h} \hat{\lambda}_{i}(H'H) \]

with the degrees of freedom \( (N-h_{0kr}, h_{0kr}, h_{1kr}, h_{1kr}) \)

where \( H'H = \hat{\Sigma}_{x}^{-1/2} (\Delta \mathbf{X}' \mathbf{M}_{x1} \mathbf{X}_{1k} \mathbf{G}) (\mathbf{G}' \mathbf{X}_{1k}' \mathbf{M}_{x1} \mathbf{X}_{1k} \mathbf{G})^{-1} (\mathbf{G}' \mathbf{X}_{1k}' \mathbf{M}_{x1} \mathbf{X}_{1k}) \otimes \Sigma_{x}^{-1/2} \)

and \( \mathbf{M}_{x1} = [I-(\mathbf{M}_{x1} \mathbf{X}_{1k} \mathbf{X}_{1k} \mathbf{M}_{x1} \mathbf{X}_{1k} \mathbf{M}_{x1} \mathbf{X}_{1k})^{-1} (\mathbf{B}'_{1k} \mathbf{X}_{1k} \mathbf{M}_{x1} \mathbf{X}_{1k} \mathbf{M}_{x1} \mathbf{X}_{1k})] \mathbf{M}_{2} \)

and 'G' is a matrix whose columns are formed by using the Gram-Schmidt orthogonalisation procedure.

**Empirical results.** In the present study we tried to examine the monetarist propositions by using Horvath and Watson test in the case of the United States (USA), Canada, Italy and Australia. The data used for the study are the quarterly data for the period 1975-I to 1998-II (total 94 observations) and are collected from the various issues of International Monetary Fund's International Financial Statistics. All the variables are taken in logarithmic form and dummy variable has been used to deseasonalise the series. Unit root tests were carried out on all the variables to test the stationarity of the series and it is found that all the variables are of I(1) process. These results allow us to apply the cointegration framework. The optimal lag length chosen is four for all the countries. All the estimates were done by using Shazam software (version 8.0). The results are given in the table below. We will discuss the three hypotheses separately below.

The known cointegrating vector used in the model to satisfy the condition of stable velocity of circulation of money is \((-1 \ 1 \ 1)\) for the order money supply, output and prices. In the case of the third hypothesis, which tests the presence of both known and unknown cointegrating vectors in the system, we used two competing vectors derived through Gram-Schmidt or orthogonalisation process, i.e., \((2 \ 1 \ 1)\) and \((0 \ 1 \ -1)\).

It was found from the estimated results that all the countries except Canada have supported the stable velocity of circulation of
money. The results also show that for all the four countries there exists an unknown cointegrating vector between money supply, output and prices (Test 2) which is highly significant at one per cent level in the case of USA and Italy and at five per cent level in the case of Canada and Australia. We can conclude from this result that for all the four countries there exists at least one unknown cointegrating vector, other than the one known cointegrating vector, if it all exist, between money, output and prices.

When we tested the joint null hypothesis of no cointegrating vector against the alternative of the presence of both known and unknown cointegrating vectors, the results reject the null only in the case of USA and Italy at five per cent and one per cent level of significance. It could not reject the null in the case of Canada and Australia. From these results one can infer that QTM has empirical support from USA and Italy but not full support from Canada and Australia. In Canada and Australia, though it does not support the stable velocity of money condition, our results shows the presence of at least one unknown cointegrating vector in the system. This means that there is another internal mechanism that will take the variables in the system to a stationary path in the long run.

**Conclusion**

The study tried to test the QTM propositions with the help of a fairly new multiple cointegration test developed by Horvath & Watson (1995). Using quarterly data for USA, Canada, Italy and Australia, the study finds that there is at least one long-run cointegrating relation between the three macro variables, viz., money supply, output and prices, in all the countries. This finding corroborates the view of QTM, and may be interesting to the policy makers in the respective countries concerned. But one cannot generalize this conclusion to all the economies. The relationship between money supply, output and prices may not be the same for all the countries. One must study these relationships in each country separately.
Notes

1. There exists an error on p.991 of Horvath & Watson (1995). In line 4, $M_{ik}$ should be read as

$$M_{ik} = [I(M_{ik}X_{ik}B_{ik})(B_{ik}X_{ik}^tM_{ik}X_{ik}B_{ik})^{-1}(B_{ik}X_{ik}^tM_{ik})] M_{ik}$$

References


### Results from the Horvath and Watson Procedure

<table>
<thead>
<tr>
<th>Test</th>
<th>USA</th>
<th>Canada</th>
<th>Italy</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW1</td>
<td>11.4079**</td>
<td>6.0539</td>
<td>64.6312*</td>
<td>6.8559***</td>
</tr>
<tr>
<td>HW2</td>
<td>31.6276*</td>
<td>14.9843**</td>
<td>87.8732*</td>
<td>14.8444**</td>
</tr>
<tr>
<td>HW3</td>
<td>13.2903**</td>
<td>6.5637</td>
<td>106.6716*</td>
<td>5.6799</td>
</tr>
</tbody>
</table>

Note:  
* Significant at 1% level.  
** Significant at 5% level.  
*** Significant at 10% level.  
Recent Working Papers

44. GOVINDA RAO
   Intergovernmental Transfers in Inverted Countries

45. MATHIYAZHAGAN
   People's Choice of Health Care Provider: Policy Options For Rural India

46. JPRIYA ROYCHOWDHURY
   The State in Comparative Politics: Critique

47. GOVINDA RAO
   Principles of Intergovernmental Transfers: Have the Finance Commissions Followed Them?

48. GOVINDA RAO
   Intergovernmental Fiscal Arrangements in a Transitional Economy: Look At Vietnam

49. ZAFED AJMAL PASHA
   Water Use and Management: Comparative Perspective from India and Canada

50. AMANULLA AND B KAMAIAH
    Indian Stock Market: Stock Integration and Market Efficiency

51. ALLEN ROY, S AMANULLA AND KAMAIAH
    Indian Stock Market: A Test of Semi-Strong Form of Efficiency

52. VRAJU AND TUSHAR SHAH
    Utilisation of Irrigation Works in Rajasthan: An Approach

53. ABIR KUMAR MOHANDAY AND KAMAIAH
    Money and its Persistence in Indian Stock Market: Case Study of 30 Stocks

54. ALLEN ROY, PRAVAKAR SAHOO AND KAMAIAH
    Fiscal Test of Fiscal Disinflation Hypothesis in India

55. ALLEN ROY, B KAMAIAH AND M GOVINDA RAO
    Educational Expenditure Needs of Large Indian States: A Normative View

56. G K KARANTH
    Does Replication Mean Consensus

57. H G HANUMAPPAPA
    State Policy Initiatives and Agricultural Development: A Case Study of Karnataka Province, India

58. G THIMMAIAH
    Federalism and Economic Development: Indian Experience

59. T KANNAN
    Caste Violence and Dalit Consciousness: A Critical Interpretation of Dominance

60. K V RAJU AND JEFFREY D BREWER
    Conjunctive Water Management in Bihar

61. MADHUSHREE SEKHER
    Local Organisations and Participatory CPR Management: Some Reflections

62. PRATAP CHANDRA BISWAL AND KAMAIAH
    Stock Market Development in India: Is There Any Trend Break?

63. SANGHAMITRA SAHU AND B KAMAIAH
    Some Aspects of Monetary Targeting in India

64. AMALENDU JYOTISHI
    Swidden Cultivation: A Review of Concepts and Issues

65. K V RAJU
    Participatory Irrigation Management in Andhra Pradesh: Promise, Practice and a Way Forward
66. D RAJASEKHAR
Non-Governmental Organisations in India: Opportunities and Challenges

67. S JYOTIHS
Willingness to Participate in Biodiversity Conservation in Periyar Tiger Reserve: A Contingent Valuation

68. ANAND INBANATHAN
Power, Patronage and Accountability in the Panchayats of Karnataka

69. PRATAP CHANDRA BISWAL & B KAMAIH
On Stock Market Development, Banks and Economic Growth in India

70. N R BHANUMURTHY
Testing Long-Run Monetarists' Propositions in Some Industrialized Countries

71. PRABIR KUMAR MOHANTY & B KAMAIH
Does Seasonal Pattern in Indian Stock Returns Contain a Unit Root?

72. V VIJAYALAKSHMI & B K CHANDRASHEKAR
Gender Inequality, Differences, and Identities: Women and Local Governance in Karnataka

73. DEBASHIS & B KAMAIH
Simple Sum Versus Divisia Monetary Aggregates: An Empirical Evaluation

74. T S JEENA
Wetland Conversion: The Case of Backwater Reclamation in Kerala

75. P H RAYAPPA, T V SEKHERR, M RAMAKRISHNA REDDY
Population Policy for Karnataka: A Suggested Framework

76. D RAJASEKHAR & P SHOBANA
Economic Programmes and Poverty Reduction: NGO Experiences from Tamil Nadu

77. PRAVAKAR SAHOO
GEETHANJALI NATARAJ, B KAMAIH
Savings and Economic Growth in India: The Long-Run Nexus

78. KAUSHIK BASU
A Note on Multiple General Equilibria with Child Labour

79. A S SEETHARAMU
Literacy, Employment and Social Security: A Review

80. T V SEKHERR
Empowerment of Grassroots Leadership in Health and Populatic A Training Experiment in Karnataka