ECONOMIC BULLETIN

January 2004 • Volume 6 • ISSN/0128 9675

CONTENTS

Department of Economic Studies
Faculty of Business Management
UNIVERSITI TEKNOLOGI MARA

ECONOMIC BULLETIN

January 2004 • Volume 6 • ISSN/0128 9675

Department of Economic Studies
Faculty of Business Management
Universiti Teknologi MARA
2004

Economic Bulletin
January 2004 • Volume 6 • ISSN/0128 9675

(WRT NOTES TO CONTRIBUTORS PLEASE REFER TO BACK PAGE)

The statements and opinions expressed by contributors do not necessarily represent those of the editorial board, advisors or association.

Typesetting : Penerbitan Salafi
Typeface : Helvetica
Type size : 11/13 point
Printed by : Penerbitan Salafi
Lot 979, Jalan Hj. Borhan, Kg. Giching Hilir,
43900 Salak Tinggi, Sepang, Selangor Darul Ehsan.
Tel.: 012-3123603, 019-2548794, 019-2572474

Table of Contents

Preface

The main objective of this journal is to provide the much needed intellectual platform to all economic lecturers of UiTM. This platform is an excellent avenue to publish their research works based on economics and at the same time provide a generous space to those who want to probe economic issues that are pertinent to the economy and the university. In a small way this journal (partially refereed) has fulfilled this role over the years and we will continue to do so in the future. As usual, the Editorial Board holds the tradition of publishing at least five articles on conventional economics and one article on Islamic economics. The Editorial Board thanks the present Dean of Faculty of Business Management, Shah Alam, for providing the impetus and the required financing to publish this much awaited Volume 6, Economic Bulletin of the faculty.

Chief Editor
January, 2004

1 Real Exchange Rate (RER) Performance in Southeast Asian Economies: Were Competitive Undervalued Currencies Used to Boost Exports?

Saadiah Mohamad
Faculty of Business Management,
Universiti Teknologi MARA

Abstract

This paper examines the RER performance of selected Southeast Asian economies of Indonesia, Malaysia, Singapore, and Thailand. Large RER depreciations in the fast growing export-industrializing East Asian economies have prompted debates that competitive undervalued currencies might have been used in order to boost exports. This paper examines this proposition by evaluating whether exchange rates in these countries have indeed experienced undervaluations. A model is developed to capture the dynamics of the RER performance in these economies for the period 1965-1998. The model evaluates the RER performance based on the Equilibrium Real Exchange Rate (ERER) framework instead of the more commonly used Power Purchasing Parity (PPP) approach. The ERER was estimated using a robust econometric model, which is based on the unrestricted error correction model (UECM), proposed by Banerjee et al. (1998). The long run relationship between RER and important economic variables were tested using a new cointegration test, the Bounds Test (Pesaran's et al (2001). Findings indicate that there is no conclusive evidence to suggest that competitive undervalued currencies were specifically targeted for. Large depreciations in RER represent the tracking of its long run equilibrium trends.

INTRODUCTION

The outward oriented Southeast Asian economies of Indonesia, Malaysia, Singapore and Thailand have experienced dramatic growth in export performance in the last three decades. Some observers have attributed this to the role of exchange rate (ER) policies in these economies. They argue that exchange rates have been

kept depreciated over the years, leading to the proposition that SEA economies might have used undervalued currencies to promote export (see for eg Montiel 1997, Benaroya and Janci 1999). Others have argued that it is the ability of these economies to avoid persistent currency misalignment that has helped the region to successfully compete in world markets (Elbadawi 1998, Saadiah Mohamad and Nair 2002, 2003).

While it is true that both nominal exchange rate (NER) and real exchange rates (RER) have shown depreciating trends in most of these Southeast Asian countries (See Figure 1), the exchange rate performance relative to a long run equilibrium level and thus whether there has indeed been an undervaluation, is less clear. In addition, currency depreciations are not the same thing as undervaluations. If the equilibrium RER (ERER) itself exhibits a depreciating trend, then a depreciating trend of the actual RER may simply reflects a movement of the RER tracking its equilibrium path. The issue then is to determine this long run equilibrium real exchange rate (ERER) and the economic factors that effect the ERER.

The objective of this paper is two fold. First, an empirical ERER model for the selected ASEAN economies is developed. The model is based on the work of Edwards (1989) and Elbadawi (1998), however the empirical model uses a new econometric method called the UECM proposed by Banerjee et al. (1998 which is more robust than the models used in the literature. To test for the existence of a long run relationship, a new cointegration test called the 'Bounds Test' developed by Pesaran et al. (2001) is used. This new empirical model will allow us to assess the impact of the determinants (fundamental variables) of the ERER for developing economies where the data is limited.

The second objective of this study is to derive good estimates for the path of ERER. This will allow us to measure the levels of misalignment between the actual RER and the ERER more accurately. Once the levels of misalignment are determined, episodes of currency undervaluation or overvaluation can then be identified.

The rest of the paper is organized as follows. In Section 2, a brief literature review on the work of equilibrium exchange rates is discussed. In Section 3, the new econometric model of for capturing the ERER in the selected ASEAN economies is given. The data used in this study is also described in this section. Section 4 discusses the empirical findings. Section 5 presents a discussion on whether currencies have been deliberately undervalued and Section 6 carries the concluding remarks.

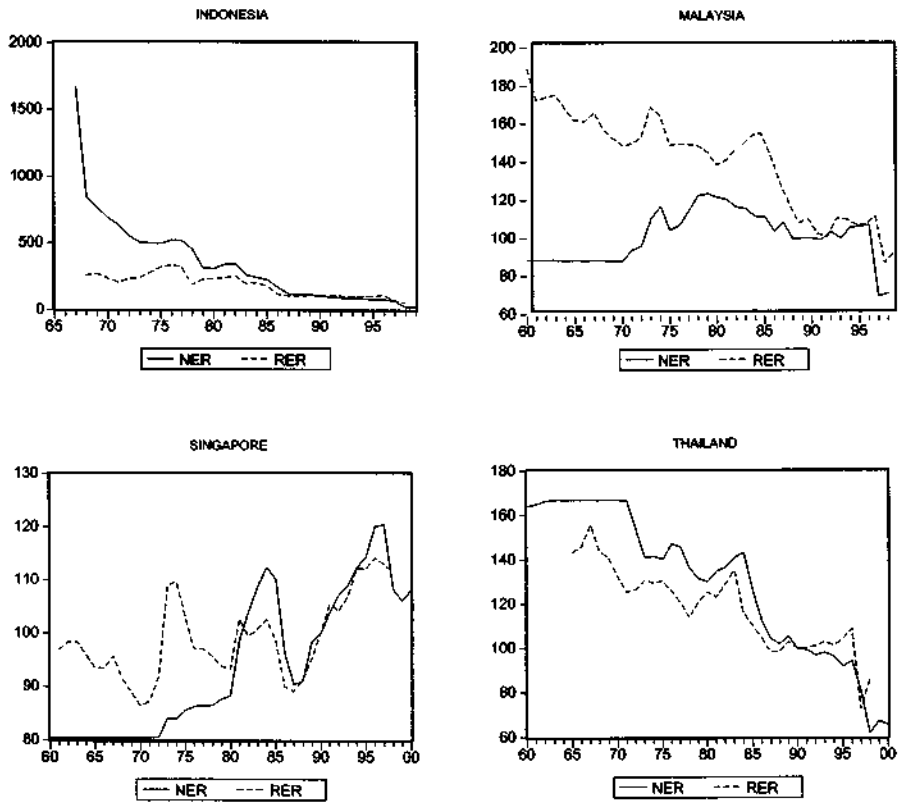


Figure 1: Real (RER) and Nominal (NER) Exchange Rates
1990=100

LITERATURE REVIEW

Exchange rate policy plays a very important role in providing increased incentives for exporting. Most countries which have successfully promoted manufactured exports experienced real exchange rate (RER) depreciation, leading to a significant increase in the domestic relative price of tradables to non-tradables (Sekkat and Varoudakis 1999: 238). Large on-going depreciations in East Asia have prompted debates about whether level of exchange rates in Asia has been undervalued on purpose and that this undervaluation was exacerbating unemployment issues in developed countries (Benaroya and Janci 1999). The experiences of the successful export-industrialising economies contrast sharply with the relatively weak performance in many other developing countries notably the Sub-Saharan African countries. The Sub-Saharan African countries are noted to have experienced prolonged episodes of RER overvaluation (Edwards 1988, Elbadawi 1998).

Exchange rate movements can have significant effects on trade. Nominal exchange rate depreciations or devaluations will result in cheaper exports and more expensive imports. These are expected to boost export performance through

increased price competitiveness. Hence, devaluations can be used as a policy to improve international competitiveness and encourage growth. But the increased price in imports may lead to higher inflation levels. Since relative inflation rates influence the net impact of ER changes on competitiveness a more useful measure of exchange rates would be real exchange rates (RER) as the concept of "real" in economics takes into account changes in inflation.

Literature suggests that real exchange rate (RER) of a currency either bilateral or effective is a widely used indicator for international competitiveness (Marsh and Tokarick 1994, Guerguil and Kaufman1998, Edwards 1989). RER depreciation is sometimes interpreted as an increase in international price competitiveness whereas RER appreciation means a loss in international competitiveness for the economy. However the relationship is not that straight forward. An RER appreciation may or may not mean a loss in competitiveness. Some authors believe that an appreciation may reflect a loss in competitiveness only when there is a misalignment but that it could mean an improvement in competitiveness when the movement in RER is due to fundamental reasons such as productivity gains (Guerguil and Kaufman, 1998: 4). As experiences from Singapore and Japan may suggest, appreciations in ER are not always associated with losses in competitiveness.[1]

According to some authors, it is levels of misalignment that matter rather than just appreciations or depreciations of RER. They argue that misalignments in ER occur when actual or observed ER departs from some notion of equilibrium RER (ERER). Many authors now claim that ERER itself can change through time,[2] so changes in actual RER need not necessarily mean misalignment of RER. Equilibrium RER (ERER) is not an observed economic variable; whether a currency is misaligned or not depends on how ERER is computed which in turn depends on what theoretical construct it is derived from.

The concept of misalignment can be a useful for two reasons. One, persistent overvaluation is seen as a powerful early warning for currency crises (Kaminsky et al., 1998). Second, situations of recurrent RER misalignment have been associated with lower growth for the economy (Edwards 1988, Cottani et al., 1990 and Ghura and Grennes 1993).[3] Collin and Razin (1997) however reveal an interesting finding in that while overvaluations are negatively linked with growth, mild undervaluations are associated positively with growth.

The above discussion reveals the importance of judging the performance of actual RER movement vis-a vis that of its long run equilibrium (ERER) in determin-

1 For discussions on Singapore see Abeysinghe and Tan, L.Y. 1998, for Japan see Yositomi, M. 1996.

2 For an extensive discussion on ERER see Williamson 1994, Elbadawi 1994; see also Edwards 1989 for a time varying concept of ERER as opposed to the constant PPP based notion of ERER.

3 His work shows many countries which experience currency crises often had persistent overvaluations prior to the crises. See Edwards (1989).

ing levels of misalignment and consequently the impact of misalignment on export competitiveness. But what factors influence RER and ERER? Exchange rates are influenced not only by trade factors such as prices and volume of exported and imported goods and services but increasingly by massive capital movements which are themselves caused by non trade factors such as interest rate differentials across countries and expectations and speculative sentiments in the financial markets. The increasing mobility and volatility of capital also raises the risk of volatile exchange rates.

As more markets become integrated into the global economy, and with the increasing process of liberalization taking place in recent years, we witness not only the rapid growth of world trade in terms of export and import of goods and services but also increasing capital mobility. Capital now moves easily across national boundaries either in support of the growth in world trade, to finance direct investments or increasingly as short-term portfolio investments.[4] With unrestricted capital flows, management of the exchange rate requires the timely detection and measurement of exchange rate mislignment so that nominal exchange and macroeconomic policy can be adjusted appropriately to avoid crises. Thus having a reasonable idea of where the equilibrium exchange rate has become an increasingly important requirement for good macroeconomic management (Hinkle and Montiel, 1999: xii-xiii).

At the conceptual level there is a substantial degree of agreement on the broad definition of long run equilibrium. This goes back to the work of Nurkse (1945) who defined ERER as that value of real exchange rate that is consistent with the dual objectives of external and internal balance, for specified values of other variables that may influence these objectives (Montiel 1999: 219). External balance refers to a situation in which current account deficit is financed by a "sustainable" level of capital flows, while internal balance refers to a situation in which the market for nontraded goods is a "sustainable" equilibrium. However there are disagreements as to what constitute "sustainability" and the term "other variables" and this has led to markedly different approaches and empirical methodologies for estimating the ERER.

In the industrializing nations much research on the ERER has been focused on the Purchasing Power Parity (PPP) approaches.[5] Basically, this involves determining the PPP path and measuring the deviations of actual RER in relation to some specified value of PPP in the base year. The PPP approach to ERER involves an assumption that in the long run RER is a constant since nominal rates respond

4 Historically trading in foreign exchange was the result of international trade as buyers and sellers need foreign currencies to settle transactions. Now currency trading has little to do with international trade which account for only two percent of global currency movements. See for example Singh (1999).

5 A discussion on the PPP based methods see Ahlers and Hinkle 1999 Estimating the Equilibrium RER Empirically: Operational approaches pp 293-313.

to changes in relative price levels. To prove this, much research has been involved with testing whether PPP holds in the long run. Empirically, over shorter periods of time, RER tends to be non-stationary and the PPP provides a poor approximation of the ERER (Montiel 1999: 262). This non-stationarity of the RER suggests non-stationarity in some underlying real fundamental determinants and there is now agreement on the eligible set of such fundamentals (ibid: 262)

A seminal work which differs from the traditional PPP approach and which recognizes this set of fundamentals in influencing ERER in the context of the developing countries is the work of Edwards (1989). Other authors that have extended the work of Edwards (1989) include Elbadawi (1994), Elbadawi and Soto (1997), Razin and Collins (1997) and more recent work of Edwards himself (1990, 1994). Since the work on PPP, research in the industrialized countries have expanded to include the structural models of Williamson's (1994) fundamental equilibrium real exchange rate (FEER) method, the IMF's desired equilibrium exchange rate (DEER), (see Bayoumi et al 1994 and Clark et al 1994) and the much celebrated Stein's natural equilibrium real exchange rate (NATREX) models (Stein 1994, Stein et al 1995).

THE MODEL AND DATA

In this section, a brief description of the theoretical framework and the econometric model that captures the dynamics of the ERER for the selected ASEAN economies is given. The RER is defined as the relative price of non-tradables (Pn) to tradables (Pt) (Edwards 1989):[6]

$$RER = \frac{P_T}{P_n} \tag{1}$$

The RER can also be written as follows:

$$RER = \frac{P_T}{P_n} = E\frac{P_n}{P_T^*} \tag{2}$$

where, P_T is the domestic price of tradables, P_n is the domestic price of non-tradables, is the world price of tradables and E is the nominal exchange rate defined as the price of domestic currency in terms of foreign currency (foreign currencies per unit of domestic currency).

6 There has been an issue whether RER should be Pt/Pn or Pn/Pt. Edwards has made use of Pt/Pn with corresponding E.P*/P. Under this definition an increase in the ratio represents a real depreciation. The IMF has made use of Pn/Pt with rresponding E.P/P*. This has an advantage where an increase in the value of the ratio represents a real appreciation, which is less confusing. In this paper I have followed the IMF convention.

Due to data constraints on the price of the tradables and non tradables, many studies make use of relative price indices between two countries or in the case of real effective exchange rates (REER) between a group of trading partners. The data for the RER in this paper is obtained from the World Bank which makes use of trade-weighted index of foreign wholesale prices (WPI) to home country's price index (CPI), converted at relevant bilateral official exchange rates.[7]

The equilibrium real exchange (ERER) rate is defined here as the steady-state real exchange rate conditional on a vector of permanent values for the fundamentals (Baffes et. al. 1999: 416), and can be described by the following linear transformation:

$$\log q_t^* = \beta' F_t, \tag{3}$$

where, q_t^* is the equilibrium real exchange rate and F_t is the vector for the fundamental variables at period t. The vector β is the parameter of interest.

The empirical analysis in this study is further motivated by the theoretical model of Elbadawi (1998) that emphasizes the interplay of the long run (flow) fundamentals of current account balance and the determinants of the longer term propensity of accumulation (or de-accumulation) of net foreign assets (NFA). The model given in this paper extends the less developed country (LDC) version of the empirical real exchange rate model (e.g. Edwards, 1989, Elbadawi 1994, Elbadawi and Soto, 1997). That is, this model incorporates the traditional current account fundamentals of the RER and three stock variables relevant for the determination of the capital account equilibrium.

Thus, the RER can be written as a function of the following determinants:

$$\log q_t = f(F_t, NFI_t, DRNK_t, MACRO_t, CNER_t), \tag{4}$$

where,

q Real exchange rate RER (defined as the ratio of the price of non–tradables tradables, where an increase in the value of RER means an appreciation.

F Vector of four trade balance fundamentals:

1. TOT — Terms of trade
2. GCON — Government consumption as a ratio of GDP
3. OPEN — Trade openness defined as total exports plus imports as a ratio of GNP
4. PROD — Productivity proxied by productivity differential between manufacturing and services industries.

7 The World Bank makes use of Pt / Pn definition so to suit the definition used in this work, the RER data in is inversed.

NFI Ratio of net income from abroad to GDP

DRNK The difference between the change in *RES* and *NKI* (i.e.), where:

i. *RES* — The ratio of change in reserves to GDP

ii. *NKI* — Ratio of net foreign capital inflows to GDP

CNER Rate of change in nominal exchange rate where exchange rate is defined in terms of foreign currency (USD) per unit of domestic currency.

MACRO Indicator of monetary policy measured as (change in domestic credit) / (lagged broad money supply)

The data for RER was obtained from the World Bank Database, which measures the trade weighted effective RER. The database defines RER as the price of tradables to non-tradables using the ratio of wholesale price index of foreign country to consumer price index of domestic country. To suit the way RER is defined in this work, the data from the World Bank database is inversed. The rest of the data is computed from data sources from the World Bank World Development Indicator (WDI CD ROM 2000) and IMF International Financial Statistics (IFS CD ROM 2000). Table 1 gives the expected signs for the parameters used in the model.

Table 1: Expected signs of parameters

Variables	**Expected Signs**
Terms of Trade (LTOT)	+ve/-ve but mainly positive
Government Consumption (LGCON)	+ve/-ve but mainly positive
Productivity (LPROD)	Positive
Openness (LOPEN)	-ve
Change in Reserves (△RES)	-ve
Net Capital Inflow (NKI)	+ve
Change in Reserves minus Net Capital inflow (DRNK)	-ve
CNER	+ve
MACRO	+ve

The equation also includes two short run determinants of RER: changes in nominal exchange rates (CNER) and a measure of monetary policy (MACRO). The short run impact of changes in nominal exchange rate is expected to be positive. That is, devaluation in a currency would lead to RER depreciation, while monetary expansion is expected to lead to real currency appreciation (a positive effect). According to Edwards (1989) these two variables (nominal variables) have no long run impacts; only the fundamental variables (the real variables) affect the RER in the long run.

The inclusion of capital account variables in the model, in addition to the

usual trade balance fundamentals permits interesting interpretations of the effects of capital account stock determinants of the RER in the long run, i.e. should a country achieve a higher sustainable level of net foreign income in the very long run, this eventually converge to a more appreciated ERER. However in the medium to long run, when the stock of net foreign assets is less than the desired level, the country has to depreciate its real currency value (i.e. run a current account surplus which is the counterpart of accumulating reserves) to allow building of assets to desired levels. The required magnitude of depreciations depends on the extent of sustainable levels of capital flows, since this supports a more appreciated RER (Elbadawi, 1998:14).

In order to estimate equation (4), a test of stationarity of the fundamental variables is carried out using the Phillip-Perron(1988) unit root test. We used this test because it allows for milder assumptions on the distribution of errors. Further, this test controls for higher order serial correlation in the series and is robust against hetereskedasticity.

The unit root tests indicate the need for an alternative estimation procedure to least squares, as many of the variables have unit roots i.e. not stationary (reports available from authors). Standard cointegration analysis such as Engle and Granger (1987), the ECM Johansen (1988) and Johansen and Juselius (1990) require a strict classification of the regressors as either I(0) or I(1) process. Results suggest that while most variables are integrated of order 1, there are variables which are stationary processes, integrated of order zero. Thus, based on the traditional cointegration methods, some of these variables have to be excluded from the model.

Further, Mah (2000) states that the ECM, Johansen (1988) and Johansen and Juselius (1990) methods are not reliable for studies that have small sample. To avoid the small sample bias problem, some empirical studies have used quarterly and monthly data. Shiller and Perron (1985) and Hakkio and Rush (1991) show that the power of the traditional cointegration tests depends more on the span, i.e., the number of years the sample covers rather than the number of observations.

In this paper, a new econometric formulation known as the UECM (Banerjee et al. 1998) to model the dynamics of ERER is used. The long run relationship between RER and its determinants is tested using a new cointegration method called the Bounds Test (Pesaran et al. 2001), which is based on the UECM. The present empirical formulation has two important advantages over the traditional cointegration methods (Engle and Granger (1987), Johansen and Juselius (1990)). First, the traditional cointegration tests are asymptotic tests, hence are unreliable for studies with small samples. The Bounds Test have been found to be robust for small sample studies (Mah (2000)). Second, the Bounds Test can be applied irrespective of the order integration of the explanatory variables. The explanatory variables can be stationary or random walk or a mixture of the two (Pesaran et al. 2001).

Next, the UECM framework developed by Banerjee et al. (1998) is outlined. For a detailed discussion of the UECM model, refer to Banerjee et al. (1998). Extension to the UECM and the Bounds Test can be found in Pesaran et al. (2001).

Let $\{z_t\}_{t=1}^{\infty}$ be a (k + 1)-vector random process, where the data generation process for this random process is characterised by the following unrestricted vector autoregressive specification below:

$$z_t = \mu + \sum_{j=1}^{p} \Phi_j z_{t-j} + \varepsilon_t, \tag{5}$$

where $z_t = [\log q_t, \chi_t]$, $\mu = [\mu_{\log q}, \mu_x]$ is the vector of means, $\delta = [\delta_{\log q}, \delta_x]$ vector for the coefficient of the trend, Φ is a matrix of VAR parameters for the lag j and ε_t is the vector of residuals.

The dependent variable is the RER ($\log q_t$) and the matrix χ_t denotes the vector of all the independent variables. The focus of this paper is on the conditional modelling of the scalar variable $\log q_t$ given the vector χ_t, and the past value of z_{t-i} (for i from 1 to t-1). Given that $= z_t = [\log q_t, \chi_t]$, we can partition the error term as $\varepsilon_t = [\varepsilon_{\log qt}, \varepsilon'_{xt}]'$, where $\varepsilon_t = [\varepsilon_{\log qt}, \varepsilon'_{xt}]' \sim N(0,\Omega)$. The positive definite variance–covariance matrix Ω is defined as follows:

$$\Omega = \begin{pmatrix} W_{\log q, \log q} & W_{\log q, x} \\ W_{\log q,x} & W_{x,x} \end{pmatrix} \tag{6}$$

The $\varepsilon_{\log qt}$ can be expressed conditionally in terms of ε_{xt} as follows:

$$\varepsilon_{\log qt} = W_{\log qx}\, \Omega_{xx}^{-1} \varepsilon_{xt} + u_t, \tag{7}$$

where $u_t \sim N(0, W_{uu})$, $W_{uu} = W_{\log q \log q} - W_{\log qx}\, \Omega_{xx}^{-1}\, W_{x\log q}$, and is independent of ε_{xt}. Substituting (7) into (5), equation (5) can be written as a vector error correction model (VECM), that is:

$$\Delta z_t = \mu + \lambda z_{t-1} + \sum_{t=1}^{p-1} \gamma_j z_{t-j} + \varepsilon_t, \tag{8}$$

where $\Delta = 1\text{-}L$, and,

$$\gamma_j = \begin{pmatrix} \gamma_{\log q \log q,j} & \gamma_{\log qx,j} \\ \gamma_{x \log,k} & \gamma_{xx,j} \end{pmatrix} = -\sum_{k=j+1}^{p} \Phi_k. \tag{9}$$

The long run multiplier matrix is given by λ_j, i.e.,

$$\lambda_j = \begin{pmatrix} \lambda_{\log q \log q} & \lambda_{\log qx} \\ \lambda_{x \log q} & \lambda_{xx} \end{pmatrix} = -I - \sum_{j=1}^{p} \Phi_j \tag{10}$$

where I is the identity matrix.

The diagonal elements of λ are left unrestricted, allowing for the possibilities that each of the series can be either $I(0)$ or $I(1)$. For example, $\lambda_{\log q \log q} = 0$ implies

that log q is I(1) and if $\lambda_{\log q \log q} < 0$, this implies that the log q is I(0).

The technique described above shows that the present formulation allows for the testing of the existence of a maximum of one long run relationship between RER and its determinants (x_t). In this case, one of $\lambda_{x \log q}$ and $\lambda_{\log qx}$ can be zero. Since the paper's objectives is to measure the long run relationship between RER and its determinants, the restriction of $\lambda_{x \log q}$ equal to zero is imposed. This restriction implies that there is no long run relationship between RER and its determinants. The short-run relationship between RER and its determinants are captured by Φ_1 to Φ_p. From the assumption of $\lambda_{x \log q} = 0$, equation (8) can be written as:

$$\Delta \log q_t = \alpha_0 + \varphi \log q_{t-1} + \Psi x_{t-1} + \sum_{j=1}^{p-1} \beta_{yj} \Delta \log q_{t-j} + \sum_{j=1}^{q-1} \beta_{xj} \Delta x_{t-j} + w \Delta x_t + u_t , \quad (11)$$

where:

$\alpha_0 = u_{\log q} - w' \mu_x$,
$\varphi = \lambda_{\log q \log q}$,
$\Psi = \lambda_{\log qx} - w' \lambda_{xx}$.
$\beta_{\log q,j} = \gamma_{\log q \log q,j} - w' \gamma_{x \log q,j}$,
$\beta_{xj} = \gamma_{\log qx,j} - w' \gamma_{xxj}$.

The φ and Ψ captures the long-run effects, while the βs capture the short-run effects of the determinants on RER. The UECM model in (11) can be estimated using the OLS method. It can also be interpreted as an autoregressive distributed lag model (ARDL).

To test for the long-run relationship between RER and its determinants, this paper uses the Pesaran et al. (2001) bounds testing approach. The bounds test is conducted where under the null hypothesis there exist no equilibrium relationships between variables. This is done by estimating the UECM in equation (11) excluding the lagged variables (log q_{t-1} and x_{t-1}). Formally, the bounds test is equivalent to conducting a restricted F-test (or Wald test), where the null and alternative hypotheses are as follows:

H_0: $\varphi = \Psi = 0$ (no long-run relationship between log q_t and x_t)
H_1: $\varphi \neq \Psi \neq 0$ (there is long-run relationship between log q_t and x_t)

The asymptotic distribution of the test statistics of the bounds test is non-standard under the null hypothesis of no cointegrating relationship between log q_t and x_t. This applies regardless of the order of integration of the explanatory variables are purely I(0) or purely I(1) or a mix of the two orders of integration. If the computed F-statistic falls outside the critical value bounds, a conclusive inference can be drawn without needing to know the integration status of the underlying regressors.

For example, if the F-statistics is higher than the upper critical bound than

the null hypothesis of no cointegration is rejected. However if it falls inside these bounds, inference is inconclusive and knowledge of the order of integration is required before conclusive inference can be made (Pesaran et al, 2001).

The rejection of the no cointegration relationship implies that there exists a stable long-run relationship between and which can be described as follows:

$$\log qt = \theta_0 + \theta_1 x_t + v_t \qquad (12)$$

where $\theta_0 = -\frac{\alpha_0}{\varphi}, \theta_1 = -\frac{\Psi}{\varphi}$, and v_t is a mean zero stationary process. Note that is the long run multiplier.

The test and estimation procedure for this ARDL model was conducted using the MICROFIT 4.0 software package developed by Pesaran and Pesaran (1997). Due to the limited number of observations of the sample and the loss of degrees of freedom, we use a maximum lag order of one. This is also in keeping with the original model by Edwards (1989). For all the countries, all the potential variables of LTOT, LPROD, LOPEN, LGCON, DRNK, NFI, CNER, MACRO and LRER(-1) are tested for long run relationship.

If the computed F-statistics cannot be rejected, then the test is done at lag 0 for the first differenced variables and if this still fails to reject the null then the least significant variable is dropped until the F-statistic is able to reject the null. This is done so that we have variables that have long run relationship with RER and therefore contribute to the estimation of long run RER i.e. the equilibrium RER.

The next stage involves estimating short and long run estimates of RER. Before that, it should be noted that a specification search procedure was adopted to eliminate highly insignificant variables. This involves a recursive process of eliminating variables with the lowest t-statistics (highest prob values) to get a more parsimonious model. This is in keeping with Pesaran et al. (2001) where the use of a more parsimonious specification is advisable at this stage even though for the first part (in testing the null hypothesis of the absence of level effects) it is important that the coefficients of lagged changes remain unrestricted, otherwise the test could be subject to a pre-testing difficulty. However, the variable CNER (nominal ER changes) and MACRO the policy variable are excluded from elimination, as they are an integral part of the short run model.

The ARDL approach to cointegration using Microfit 4.0 allows us to determine the optimal lag length for the model using either the Akaike information criteria (AIC) and/or the Schwarz Bayesian criteria (SBC).

The long run coefficients obtained can then be used to generate the long term path of RER. This long term path of RER represents the equilibrium RER (ERER) which is defined as the RER that is consistent with the internal and the external

balance. However, the problem with this lies in the practice of defining equilibrium values as the estimated long run values set at the actual values of the determinants, hence the issue of sustainability is overlooked. To rectify this and to make sure that the estimation technique ensures that the determinants are empirically valid, a calibration technique was used to ensure that the equilibrium values of the determinants are defined relative to some concept of "sustainability." The long run elasticities are used to derive ERER for given "sustainable" or "permanent" values of the fundamentals.[8] In this paper, a simple 5 years moving averages of the fundamentals are used to represent the sustainable values.[9] Once the path for the ERER is generated, the values are then compared with the actualc RER, giving rise to misalignment measurements. Misalignment in this case is defined as the difference between actual RER and the predicted or the computed ERER expressed as a percentage. The graphs of actual and predicted RER as well as misalignment measures can then be compared with the known currency episodes.

EMPIRICAL FINDINGS

Based on the Bounds test in Table 2, the computed F-statistics exceeds the upper critical value for Malaysia and Indonesia with the 8 regressors at the 5% significance level. This implies that there exists a long run relationship between the RER and the 8 regressors in these economies. In the case of Thailand, the rejection of the null hypothesis of no cointegration can be established if LPROD and LOPEN are dropped from the model. This implies that RER and LGCON, LTOT, NFI and DRNK are co-moving at the 5% significance level. For Singapore, cointegration relationship can be established if TOT is excluded from the model, implying that the RER in Singapore is cointegrated with all the predictor variables, except TOT.

Details of short run and long run output are available on request from the author. Table 3 gives the final specification for the most parsimonious model for the estimated (long run equilibrium) RER for each country.

Overall, the long run estimates for all the four countries corroborate the theoretical predictions, with Malaysia and Singapore performing better than the other two countries. For Indonesia and Thailand we have to include some variables even though they are insignificant at conventional levels in favour over those with the wrong signs and also to prevent under specification. All the models chosen

8 Williamson (1994:187) recommends an ex ante approach for estimating "the set of real effective exchange rates or paths needed to achieve simultaneous internal and external balance by some date in the medium-run future and to maintain balance thereafter. "The so called "fundamental equilibrium exchange rate (FEER) well known after him, calls for assuming behavioral specifications for the fundamentals i.e.to derive a path for ERER given the assumed path of fundamentals. Although Elbadawi uses and Soto (1997) where they compare the FEER method to an ex post approach. No siginificant differences were found but FEER approach is more amenable to policy simulations.

9 See Baffes et al (1999:444) for a justification for using moving averages in small sample studies.

pass the diagnostic tests of Lagrange multiplier test of serial correlation, Ramsey's RESET test for functional form.

Table 2: Cointegration Test – The Bounds Test

Country	Computed F statistics	Critical Bounds*	
		Lower	Upper
Indonesia (8 regressors)	12.072	2.272	3.447
Malaysia (8 regressors)	5.872	2.272	3.447
Singapore (7 regressors)	4.544	2.365	3.553
Thailand (6 regressors)	3.537	2.141	3.250

* at 5% significance. Critical Values are taken from Pesaran and Pesaran (1997) Table F Case II: Intercept and No Trend, Pp. 478. Lag Structure = 1.

normality test and heteroscedasticity test, with all the models having adjusted R-squared more than 0.85.

The long run coefficients of the fundamentals obtained in the last section are now used to derive the equilibrium real exchange rate ERER. The set of permanent values or sustainable values of fundamentals are taken from the five years moving averages of the fundamentals. Misalignment indices are then computed as the difference between actual RER and ERER as a percentage of ERER. Figure 2 shows the trends in the computed ERER versus that of the actual RER and the RER misalignment, RERMIS. Table 4 shows the magnitude of the RER misalignment in percentages. The actual RER movement in all the countries except for Singapore follows a depreciating trend, with implications of increasing international competitiveness. For Singapore, the earlier depreciating trend seems to have haltered by mid 1980s. However, examining the actual RER without looking at the ERER and thus, the possibility of misalignment from these values can be misleading.

Table 3: Long Run Parameter Estimates for selected ASEAN Countries

	Indonesia	Malaysia	Singapore	Thailand
Constant	1.4878**	4.8838*	6.1342*	3.2528*
	(2.16)	(6.5)	(7.82)	(2.55)
Log(TOT)	0.5793*	0.4035**		0.2098
	(0.308)	(2.4)		(1.01)
Log(GCON)	-0.3309		-0.0859	0.2845***
	(-0.93)		(-0.44)	(1.83)
Log(PROD)	-1.6739*	-0.2385*	0.2776**	
	(-8.01)	(-5.22)	(2.02)	

Log(OPEN)		-0.4669* (-8.58)	-0.1914** (-2.22)	
NFI			0.0223* (2.78)	0.0812*** (1.73)
DRNK	0.0031 (0.3)	-0.0125* (-5.29)	0.0060** (2.11)	0.0047 0.76)
Adjusted R^2	0.94	0.97	0.88	0.87

Note: The numbers in parentheses are t-ratios. The dependent variable is log (RER). *,**,*** denote 1%, 5% and 10% levels of significance.

The empirical results of this work validates more recent work that the equilibrium rate itself is not a time invariant variable as opposed to earlier work on purchasing power parity theory. The computed ERER gives evidence that the equilibrium itself changes overtime and in this case, Indonesia, Malaysia and Thailand exhibit a depreciating trend while Singapore is the only country that exhibits an appreciating trend. In all the countries, the movements in actual RER seem to track the ERER i.e. the RER seems to have a long run downward trend following the long run downward trend in ERER.

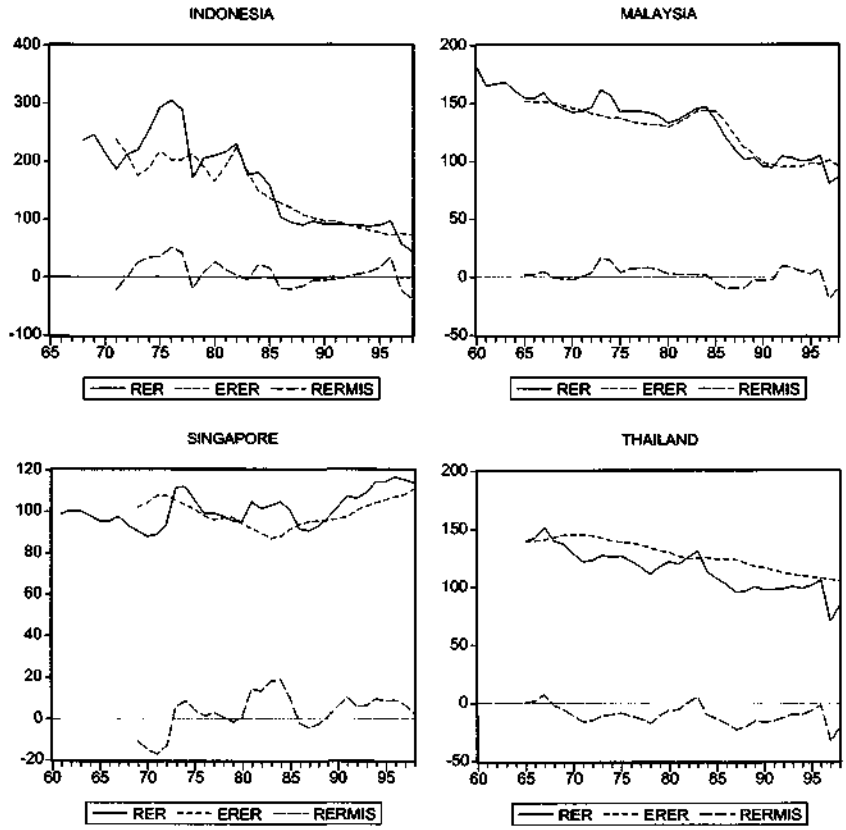


Figure 2: Actual RER, Estimated ERER and RER Misalignment (RERMIS)

However, countries differ in terms of the magnitude of misalignment and as shown in Figure 2 and Table 4, Indonesia and Thailand have higher levels of misalignment. Malaysia indicates the "best" performance in terms of tracking the ERER, with misalignment levels since 1975, never reaching double digits, except in the crisis year of 1997. Singapore seems to exhibit more years of overvaluation, but except for the early 1980s, misalignment has seldom reached 10 %. In the mid 1980s all countries show evidences of some amount of undervaluation. This very well coincides with the economic recession of the 1986, which most observers would point to an episode of undervaluation.

Table 4: RER Misalignment (%)

Year	Indonesia	Malaysia	Singapore	Thailand
1965	NA	2.147046	NA	0.405256
1966	NA	2.343870	NA	1.798811
1967	NA	4.972974	NA	7.642010
1968	NA	-0.136898	NA	-1.776395
1969	NA	-1.549527	-10.88203	-5.254745
1970	NA	-2.319910	-15.28358	-11.22335
1971	-21.53582	0.053358	-17.14647	-15.99667
1972	-0.547301	3.727691	-12.81491	-14.49130
1973	24.95504	15.93871	5.671279	-10.65420
1974	34.17947	14.64851	8.667111	-9.879951
1975	34.94665	3.838899	4.366507	-8.273732
1976	50.65458	6.830400	1.324499	-11.05992
1977	42.20903	7.731433	3.176550	-13.69947
1978	-19.44209	8.031147	0.636884	-17.18833
1979	7.986588	6.163275	-1.431418	-10.58638
1980	26.55677	3.086971	1.003995	-6.035975
1981	12.73987	1.809769	14.30539	-5.368431
1982	2.793704	2.092504	13.28281	1.026726
1983	-4.329741	1.806043	18.11179	5.174594
1984	21.54012	1.690776	18.75385	-10.16262
1985	16.41818	-5.553879	9.994462	-13.56042
1986	-19.34585	-9.788509	-2.168913	-17.60646
1987	-20.14198	-9.828113	-4.479454	-22.79771
1988	-15.68812	-9.491248	-2.289793	-20.52117
1989	-5.189561	-2.588970	1.355632	-15.07106
1990	-5.509866	-2.944078	6.082490	-16.44545
1991	-4.383689	-2.355839	10.19832	-14.72368

1992	0.305713	9.332905	5.921156	-12.15686
1993	4.978946	8.349233	6.438103	-9.164215
1994	8.427084	4.846081	9.792729	-9.966416
1995	16.91082	2.599268	8.493253	-6.289692
1996	34.52227	7.150944	8.980943	-1.566320
1997	-23.20986	-19.45138	6.760194	-33.46977
1998	-39.51221	-9.249701	2.630080	-20.33061

This undervaluation has come down and by mid 1990s, there appears to be an overshooting with countries (except for Thailand) showing levels of overvaluation. The model manages to show the undervaluation caused by the 1997-98 currency crisis and the overvaluation, which most observers would agree to have occurred in the years before the crisis.[10] Empirical findings of this work also suggest that countries with higher levels of misalignment like Indonesia and Thailand seem to exhibit longer years of misalignment and perhaps not by mere coincidence, the two have suffered most during the financial crisis.

WERE CURRENCIES DELIBERATELY UNDERVALUED?

Figure 2 shows that the big misalignments occur mostly during the earlier period of the 1970s (overvaluations) and when the economies were hit with shocks such as the recession of the mid 1980s and the 1997 Asian financial crisis (undervaluation). The rather huge overvaluations in the 1970s have reduced in size in all the four countries and the sizeable devaluations during both crises have been reduced or even eliminated subsequently. The depreciations in RER in the 1970s and 1980s represent the tracking down of ERER from the previous highly overvalued positions. Especially in the case of Malaysia, this provides some support that the relevant authorities have not "irresponsibly" devalued the currencies much against economic fundamentals. In addition, as indicated in the case of Singapore, governments need not always target a depreciating trend in order to boost export.

However, whether such performances have been due to a deliberate exchange rate policy is more difficult to establish because it is difficult to disentangle the market forces at work. While we can point to possible manipulations in the exchange rate if the observed RER follows a different path to ERER,[11] similarities in the path of actual RER and the ERER do not necessarily mean an absence of a deliberate policy. The similarities in the path could be due to a failed deliberate policy to achieve an otherwise trend.

10 In the case of Thailand this model shows a reduction in undervaluation, nearer to the crisis, rather than an increase in overvaluation.

11 Even this can be argued, since severe misalignments can be the result of economic shocks, rather than severe manipulation on the part of exchange rate policy.

Alternatively, this could represent a successful policy to correct market failures and distortions in the past.

Regardless of whether the observed movements in exchange rates have been deliberately managed or a result of market forces, they have clearly made a difference to export performance in this region. The long term trend of nominal and RER depreciation has contributed to making the region more competitive and has encouraged the rapid growth of exports.

CONCLUSIONS

The findings from this work suggest that in all the four countries the movements of the actual long run RER have in fact more or less tracked their equilibrium path (ERER) although from the mid 1980s till early 1990s, there are evidences of undervaluation in all the countries. Also, misalignment levels have been greater for Indonesia and Thailand than in Malaysia and Singapore. In terms of the type of misalignment, Singapore shows more years of overvaluation while Thailand has a longer episode of undervaluation. We conclude that there is no conclusive evidence to suggest that a competitive RER undervaluation policy has been used through–out the export industrialization years in the last three decades in all these four countries.

It can be argued that the existence of "good" fundamentals (low inflation, low unemployment and reasonable balance of payments, at least before the crisis) has made it possible for these countries, especially Malaysia, to avoid large deviations. Thus, it is not exchange rate management per se, but management of the whole macro-economy consistent with the achievement of sustainable fundamentals, which has made the difference. Even in the case of Singapore, the same principle applies, but in this case, that of allowing an appreciating ERER trend. Singapore has been known for a staunch anti-inflation policy, where its exchange rate management has been targeted at controlling prices rather than achieving a competitive rate for its exports. For this reason, it has not intervened to reverse the appreciating trend of its RER, although there could be interventions to prevent the full-scale effects of market forces.

As it turned out, in the last three decades Singapore remained a strong competitive economy boosted by increases in its productivity. In fact, Singapore has benefited from the appreciation through cheaper imports of higher technology, which has allowed innovation, and knowledge based growth to take place. The Singapore experience indicates that an appreciating RER need not be against the interest of export-orientation, although more recent scenario indicates that even Singapore has new challenges to confront.

REFERENCES

Abeysinghe & Tan, L.Y. 1998. Exchange rate appreciation and export competitiveness. The case of Singapore. Applied Economics 30: 51-55.

Ahlers, T.O & Hinkle, L.E. 1999. Estimating the equilibrium RER empirically: operational approaches. In Hinkle, L., and Montiel, P. Exchange rate misalignment, pp. 293-313. Oxford: Oxford University Press.

Baffes, J., Elbadawi I., and O'Connell, S., 1999. Single-equation estimation of the equilibrium real exchange rate. In Hinkle, L., & Montiel, P., Exchange Rate Misalignment, pp. 405-464. Oxford: Oxford University Press.

Banerjee, A.J., Dolado, T. and Mestre, R. (1998), Error-correction mechanism test for cointegration in single-equation framework. Journal of Time Series Analysis, 19, 267-283.

Bayoumi, T., Clark, P., Symansky, S., and Taylor, M., 1994. The robustness of equilibrium exchange rate calculations to alternative assumptions and methodologies. In Williamson (ed) Estimating Equilibrium Exchange Rates, pp.19-59. Washington: Institute for International economics.

Benaroya, F. and Janci, D. 1999, Measuring exchange rate misalignments with purchasing power parity estimates. In Collignon, S. & Pisani-Ferri, J. (eds) Exchange Rate Policies in Asian Emerging Countries. Routledge Press, London.

Clark, P., Bartolini, L., Bayoumi, T., and Symansky, S. 1994. Exchange rates and economic fundamentals : A framework for analysis. IMF Occasional Paper 115 (December). IMF, Washington D.C.

Cottani, J., Cavallo, D. and Khan, M.S. 1990. Real exchange rate behavior and economic performance in LDCs. Economic Development and Cultural Change 39 (October), pp. 61- 76.

Edwards, S., 1988, Real and monetary determinants of real exchange rate behaviour. Journal of Development Economics, 29 (3), pp. 311-341.

_____. 1989. Real Exchange Rates, Devaluation, and Adjustment. Cambridge, Mass.: MIT Press.

_____. 1990. Real exchange rates in developing countries: concepts and measurements. In Grennes T.J., ed., International Financial Markets and Agricultural Trade, pp 56-108. Boulder, Colo.: westview Press.

_____. 1994. Real and Monetary determinants of real exchange rate behaviour : Theory and evidence from developing countries. In Williamson, J. (ed) Estimating Equilibrium Exchange Rates. pp 61-91. Washington: Institute for International economics.

Elbadawi, I.,1994. Estimating long run equilibrium exchange rates. In Williamson (ed) Estimating Equilibrium Exchange Rates, pp. 93-131. Washington: Institute for International Economics.

_____. 1998. Real exchange rate policy and non-traditional exports in developing countries. Research for Action 46, UNU/WIDER.

Elbadawi, I. and Soto, R., 1997. Capital flows and long–term equilibrium real exchange rates in Chile. Revista de Analisis Economico, 12, No.1, pp 35-62.

Engle, R.F. and Granger, C.W.J. 1987. Cointegrating and error correction: Representation, estimation and testing. Econometrica, 55, pp 251-276.

Ghura, D., and Grennes, T.J, 1993. The real exchange rate and macroeconomic performance in Sub-Saharan Africa. Journal of Development Economics 42, pp. 155-174.

Guergil, M. & Kaufman, M. 1998. Competitiveness and the evolution of the real exchange rate in Chile. IMF working paper WP/98/58.

Hakkio, C.S. and Rush, M. (1991) Cointegration: how short is long-run? Journal of International Monetary and Finance, December, pp.571-581.

Hinkle, L., & Montiel, P., 1999. Exchange Rate Misalignment: Concepts and Measurement for Developing Countries. Oxford: Oxford University Press.

Johansen, S. 1988. Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12, pp. 231-254.

Johansen, S. & Juselius, K. 1990. Maximum likelihood estimation and inference on cointegration with applications to the demand of money. Oxford Buletin of Economics and Statistics, 52,

pp. 169-210.

Mah, J.S. 2000. An empirical examination of the disaggregated import demand of Korea-the case of information technology products. Journal of Asian Economics, 11. pp 237-244.

Marsh, I.W. & Tokarick, S.P. 1994. Competitiveness indicators: A theoretical and empirical assessment. IMF working paper. WP/94/29 March.

Montiel, P.J. 1997. Exchange rate policy and macroeconomic management in ASEAN countries. In Hicklin. J.; Robinson D. and Singh, A. (eds) Macroeconomic Issues Facing ASEAN Countries. Washington: International Monetary Fund.

_____. 1999. The long run equilibrium real exchange rate : conceptual issues and empirical research. In Hinkle, L., & Montiel, P., Exchange Rate Misalignment : Concepts and Measurement for Developing Countries, pp. 1-37 .Oxford: Oxford University Press.

Nurkse, R., 1945. Conditions of International Monetary Equilibrium. Essays in International Finance 4 (Spring). Princeton, New Jersey: Princeton University Press, International Finance Section.

Phillips, P.C., & Perron, P. 1988. Testing for a unit –root in time series regression . Biometrika, 75: 335-346.

Pesaran, H., Shin,Y., and Smith R.J. 2001. Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16, pp 289-326.

Razin, O. and Collins, S. 1997a. Real exchange rate misalignment and growth. National Bureau of Economic Research. Working Paper 6174.

Saadiah Mohamad & Mahendhiran Nair. 2002. Exchange rates and export competitiveness in selected ASEAN countries. Proceedings of the Eighth International Convention of the East Asian Economic Association. Kuala Lumpur 4-5 Nov. 2002.

Saadiah Mohamad & Mahendhiran Nair. 2003. Exchange rate policy in selected ASEAN countries: Were currencies deliberately undervalued to promote export performance. Paper presented at the 15th Convention of the Malaysian Economic Association. Kuala Lumpur 22-23 July 2003.

Sekkat, Kh. & Varoudakis, A. 2000. Exchange rate management and manufactured export in Sub-Saharan Africa. Journal of Development Economics 61: 237-253.

Shiller, R.J. and Perron, P. 1985. Testing the random walk hypothesis: power versus frequency of observation, Economic Letters, 18, 381-386.

Stein, J., 1994. The natural real exchange rate of the US dollar and determinants of capital flows. In Williamson, J., ed., Estimating Equilibrium Exchange Rates, pp 133-176. Washington D.C. : Institute for International Economics.

Williamson, J., 1994. Estimating Equilibrium Exchange Rates. Washington D.C.: Institute for International Economics.

Yoshitomi, M. 1996. On the changing international competitiveness of Japanese manufacturing since 1985. Oxford Review of Economic Policy 12 (3), 61 73.

2 The Economics of Wetlands Conservation: Case of Paya Indah Wetlands, Malaysia

Jamal Othman
Faculty of Economics,
Universiti Kebangsaan Malaysia.

Shahariah Asmuni
Faculty of Business Management,
Universiti Teknologi MARA.

Abstract

Benefits of wetlands resources that are tradable in the market, for example, wood products and fish are readily observable through market prices. However, non-marketable benefits such as the preservation of environmental functions and ecosystems do not carry explicit market signals. This study attempts to estimate the non-marketed benefits of Paya Indah wetlands from the perspective of non-users in Selangor using the Contingent Valuation (CV) method. Results from the open ended CV indicate that the mean willingness to pay (equivalent surplus) ranges from RM12 – RM17 annually. The large sum of monetary value that households place for the conservation of Paya Indah illustrates partially the lower bound social benefits in terms of non-use values that society at large obtains from the assurance that the wetland is to be maintained as a site for nature. This strongly indicates that conservation of the wetlands is highly valued by the general public.

Keywords:
Wetlands Benefits, Non-Use Values,
Contingent Valuation, Environmental Valuation

INTRODUCTION

Values of non-market goods and services such as environmental resources are often being underestimated, making them insignificant when it comes to decision-making involving the use of these goods and services. Ignoring these benefits (or costs) could lead to decisions that are inefficient or socially unjustifiable. For that matter there is a need to ascertain the non-transparent values that these goods hold.

Environmental valuation is the attempt to assign economic (quantitative) values to the flows of environmental goods and services, which are not transacted in ordinary market mechanism. It was pioneered in the US in the 1960's. Environmental valuation assists policy makers and interested parties in identifying the economic values of a change in resource allocation. Over the past two decades, environmental valuation is increasingly used in many developed countries, most notably the US, UK and Australia as a complementary tool in public decision-making involving critical environmental-resources such as forest, wetlands, water, wildlife, biodiversity, agricultural externalities, rural landscape, and air quality.

In Malaysia, environmental valuation has not been incorporated in any public decision-making processes. However, interest in this field has been increasing as a result of increased public awareness on environmental quality.

This paper presents the result of a valuation exercise conducted on a wetland site in Kuala Langat, Selangor (Paya Indah Wetlands). The study aims at measuring the non-marketed values of conserving the wetland from the perspective of non-users in the state of Selangor.

Wetlands provide an array of benefits to mankind. For those benefits that are tradable in the market, for example timber and fish, monetary values of these benefits are apparent. However, for equally essential albeit non-marketable benefits from the wetland such as preservation of species through the conservation of their habitats and ecosystems, these benefits are implicit and less objective.

Problems arise when a natural resource site such as wetlands is being considered for conversion to meet development needs. In this case, there is a need for an economic valuation study to examine the proposed resource allocation plan. As for the case of wetland in this study – the Paya Indah Wetland Sanctuary (Paya Indah) – conversion to alternative uses might not be very unlikely in the not so distant future since the wetland is located in the midst of the futuristic nation's administrative capital city, Putrajaya as well as Cyberjaya. However, the more immediate issue at hand for the wetland is justifying the economics of conservation. A valuation exercise to measure the benefits of conservation from the society's point of view will provide an economic basis for maintaining the area as a sanctuary for nature. The findings of study may also be used to assist the management of the wetland in determining the viability of conserving the area in the long run.

ENVIRONMENTAL VALUATION

A host of environmental valuation techniques exist in the literature. To date, the Contingent Valuation (CV) has been the most widely used technique. It has the unique strength to estimate all value types including non-use values of environmental services. While there have been thousands of CV applications worldwide, very few published works have been found involving Malaysian cases in the litera-

ture. The following summarizes several selected studies pertaining to the use of CV in estimating use and non-use values.

Kaplowitz and Hoehn (1998) surveyed residents from Chelém, Progresso and Chuburná in Yucatán, Mexico to obtain qualitative and quantitative data on community use and nonuse values of Chelém Lagoon, a mangrove wetland bordered by these three areas. The aggregate use values, derived based on the aggregate use value of chivita, a water specie considered to provide a primary economic activity for the communities was approximately USD230,000 to USD350,000 annually.

Loomis et al. (1993) studied the unreserved national estate forests of southeastern Australia through a survey on the adult population of Victoria state using both open-ended and close-ended CV approaches. The mean open-ended willingness to pay (WTP) for forest preservation for different options that cover areas of different sizes was calculated within the range of USD39 to USD103.

Stevens et al.(1991) conducted two separate studies on wildlife focusing at measuring existence value. One study used the Dichotomous Choice CV to examine the economic value of the Atlantic salmon restoration program to residents of Massachusetts. The other used the Open Ended CV tobit model to value bald eagles, wild turkeys and coyotes in New England. The WTP estimates range from a low USD2.08 to a high USD28.25 depending on the type of good under study. The results were reported to be 'reasonable' and comparable with other previous studies.

Most Malaysian cases on environmental valuation have applied the Travel Cost Methods (TCM) to estimate the benefits of nature-based recreation - for instance, Shuib (1991), Willis et. al. (1996), Jamal and Redzuan (1998), Jamal (2000). There has been fewer published studies of a CV application: Mustapha (1993) and Jamal (2001) employed the dichotomous choice and open-ended CV formats to estimate the benefits of a lake recreation and non-use values of forest resources, respectively.

PAYA INDAH WETLAND SANCTUARY (PAYA INDAH)

Located in the district of Kuala Langat in Selangor, Paya Indah is a 3100-hectare man-made wetland encompassing 14 lakes, the 2500 hectare North Kuala Langat Peat Swamp Forest Reserve (NKLPSFR), a logged forest area and some cleared hills. Before the area was turned into a sanctuary for nature, much degradation has taken place due to human activities such as tin, clay and sand mining on the open lakes, logging of the peat swamp forests and farming and hunting by Native Orang Asli living on the northern border of the wetland area.

Paya Indah has been home to a number of 142 species of birds, 40 species of fish, 35 species of mammals and reptiles and 220 species of aquatic and ter-

restrial plants and rare herbs, some of which are identified as endangered species (Malaysian Wetland Foundation, 1996). This plus the importance of the NKLPSFR as a pool for plant genes highlights the importance of maintaining the area as a conservation site. Restored as a conservation site since 1997, Paya Indah is now open for public recreation.

THE STUDY METHODOLOGY

Theoretical Framework

This study attempts to measure conservation benefits from non-users perspective (non use values). The CV is used to derive willingness to pay (WTP) for individuals residing in Selangor state to ensure that the wetland is conserved. From this value, the aggregate monetary benefits of conserving Paya Indah for the urban dwellers of Selangor are estimated. In estimating this value, the CV with both open-ended and close-ended WTP elicitation format was employed.

Contingent valuation is defined as 'any approach to valuation of a commodity that relies upon individual responses to contingent circumstances posited in an artificially structured market' (Seller et. al., 1985). In the study for Paya Indah, individuals were asked directly to reveal how much they were willing to pay to avoid some assumed levels of decline in the provision of a group of services representing a certain quality of Paya Indah as a wetland.

The theoretical basis of CV used in this study is the equivalent surplus (ES) measure of welfare. For this study, in obtaining a value for Paya Indah environmental service flows, suppose that a person derives utility from a bundle of marketed goods and services, denoted by X and a certain quality of Paya Indah denoted by Z. In Figure 1, the household is assumed to be initially at position A on utility level U_0. The budget line is constant, implying that individual's budget is unaffected by a change in Z, a non-priced good. A decrease in the quality of Paya Indah from a change in land use policy results in the shift to point B on a lower utility level, U_1. Assuming that the household has a right to the initial amount of Z, then to ensure that Z_0 is maintained, a certain amount of income (WTPES) is taken from M_0 to allow the individual to remain at the initial quality level but at the subsequent (new) utility level. The individual will move to position D where the level of utility remains the same as in position B.

Based on the indirect utility functions, the WTP^{ES} as described above can also be illustrated as $V_0 (X, Z_0, M_0) = V_1 (X, Z_0, M_0\text{-WTP})$, where M_0 is initial income level, Z_0 and Z_1 represent different sets of environmental attributes (Z_0 being the set of attributes prior to a policy change), and X represents other marketed goods.

Questionnaire Design

The questionnaire began with a brief introduction of wetlands in general and a sufficient description of Paya Indah, which includes its significance as a conservation site and potential land use conflicts in the future. It then asked questions related to respondents' attitudinal characteristics toward the environment and their socioeconomic as well as demographic backgrounds. To enhance respondents' understanding of the environmental good being valued, a colored photo and a map of the site were attached with each questionnaire.

At the end of the questionnaire, respondents were presented with a constructed environmental market meant to elicit their WTP for Paya Indah conservation. The constructed environmental market includes details on why Paya Indah needs to be conserved, how conservation works in the site has been financed so far, why continuous conservation efforts in the future is needed and why monetary contribution by the society is required. The payment vehicle used for the WTP question was an annual contribution to a conservation fund, chosen for its common usage when dealing with contributions for social causes in Malaysia. The fund was to be collected throughout Malaysia from adult individuals representing households.

The statement from the hypothetical scenario leading to the WTP question reads as follows:

> Without continuous conservation efforts, the number of wildlife, migratory bird and plant species and recreational facilities are assumed to decrease by 10% within the next 10 years.

The other version of the survey used a larger (30%) change in a similar statement. Both values were identified by Paya Indah technical environmental officers as plausible.

The following WTP question was posed to respondents, asking for a discrete yes/no answer to a specific predetermined amount (bid prices estimated through a focus group session prior to the actual survey are RM1, 5, 20 and 50). Respondents were reminded that their contributions would reduce their budgetary allocations for other purposes.

> To avoid the (given percentage) decrease in environmental quality of Paya Indah, would you be willing to contribute to this fund (Paya Indah conservation fund) if the amount of contribution were determined at RM (bid price) per year?
> Answer: Yes / No.

Following the above discrete choice questions, respondents were given the flexibility to state their desired annual contribution to the Paya Indah conservation

fund. Essentially, this is simply the typical open-ended CV format.

The Empirical Model

In estimating the desired non-use values of conservation, the WTP function follows the general WTP function often used in literature:

$$WTP = f(AGE, INCOME, ENVT, EDU) \quad [1]$$

where AGE represents age of respondent, INCOME represents gross household income, ENVT represents environmental attributes or respondent's perception on the environment and EDU represents highest education level of respondent.

The WTP function also includes bid price since respondents' answers were expected to be influenced by the level of posted price. The model specification for Paya Indah is as follows:

$$WTP = \alpha + \beta_1 PRICE + \beta_2 AGE + \beta_3 INC + \beta_4 ENVT + \beta_5 EDU + \beta_6 SCOPE \quad [2]$$

where:

WTP	=	response to posted price; 1 = yes; 0 = no
AGE	=	age;
INC	=	gross household income;
ENVT	=	dummy variable for level of concern on general environmental issues; 1 = very concerned; 0 = others
PRICE	=	bid price offered to respondent
EDU	=	proxy for income; dummy variable for highest education level; 1 = college education; 0 = others
SCOPE	=	dummy variable for percentage change in the environmental quality of Paya Indah; 1 = 30%; 0 = 10%;

The model used for the dichotomous choice CV follows closely the logistic model presented by Hanemann (1984). An individual representing a household derives utility from two attributes -- knowing that the environmental quality of Paya Indah is maintained and money income. Variable z is used to represent Paya Indah's environmental quality, where z = 1 if the quality is maintained and z = 0 if quality is reduced (refer to Figure 1).

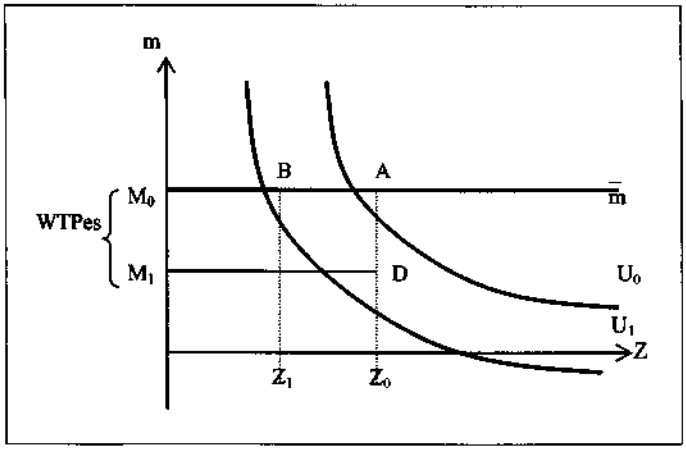


Figure 1: Equivalent Surplus Welfare Measure

Income is denoted by m, and other observable attributes of the individual that may affect his preference, such as age, education and concern for the environment are denoted by the vector s. If the quality of Paya Indah is maintained, the individual's utility is $u_1 = u(1, m; s)$; if it is reduced, his utility is $u_0 = u(0, m; s)$.

Taking into account components of the individual's utility that are not observable to the researcher, a stochastic term, $\in$ is entered, changing the utility function into:

$$u(j, y; s) = v(j, y; s) + \in_j, \qquad j = 0,1 \qquad [3]$$

where $\in_0$ and $\in_1$ are independent and identically distributed random variables with zero means.

To avoid a reduction in the quality of Paya Indah, an individual consents to pay a given posted price, RMA if $v(1, m - A; s) + \in_1 > v(1, m: s) + \in_0$ and refuses otherwise. Treating the individual's response as a random variable, his probability distribution is given by:

$$P_1 = \text{Pr}\{\text{Answering Yes}\}$$
$$= \text{Pr}\{v(1,m - A; s) + \in_1 > v(0, m: s) + \in_0\} \qquad [4]$$

$$P_0 = \text{Pr}\{\text{Answering No}\} = 1 - P_1 \qquad [5]$$

Define the random variables $\eta = \in_1 - \in_0$ and let $F_\eta(.)$ be the cumulative distribution function (c.d.f.) of η. The probability of saying *yes* can now be written as:

$$P_1 = F\eta(\Delta v) \qquad [6]$$

Where:

$\Delta v = v(1, m - A; s) - v(0, m; s).$ [7]

$= \alpha + \beta_1 PRICE + \beta_2 AGE + \beta_3 INC + \beta_4 ENVT + \beta_5 EDU + \beta_6 SCOPE.$ [8]

$F\eta$ (.) is the c.d.f. of a standard logistic variate. Thus:

$$P_1 = F_\eta(\Delta v) = (1 + e^{-\Delta v})^{-1} \quad [9]$$

An equivalent way to express the binary response probability is

$$P_1 = Pr\{WTP^{es} > A\} = 1 - G_{ES}(A) \quad [10]$$

where G_{ES} (.) is the c.d.f. of WTP^{es}, the equivalent surplus or the individual's maximum (WTP) and where ES satisfies:

$$u(0, m; s) = u(1, m - WTP^{es}; s) \quad [11]$$

or $$E\{u(0,m:s)\} = E\{u(1,m - WTP^{es}: s)\} \quad [12]$$

The welfare measurement (ES) is the mean of this distribution:

$$WTP^{es} = \int_{\min A}^{\max A} 1 - G_E(A)]dA \quad [13]$$

For the open-ended CV, the mean WTP was simply the arithmetic mean of WTP responses solicited from respondents. Mean WTP for both urban and rural respondents was also contrasted. To validate the WTP responses, we employed an OLS regression on the following model specification:

$$WTP = f(AGE, INC, EDU, ENVT, SPLCAT, SCOPE, PRICE) \quad [14]$$

WTP = Stated respondents' WTP annually
SPLCAT = Dummy variable (urban respondents = 1; rural respondents = 0)
PRICE = Posted price (dichotomous choice CV)
All other variables have been defined earlier.

Survey Procedure

A total number of 457 (valid samples) proportionate (according to area populations) and randomly selected non-user respondents representing 25 rural and urban residential areas in the state of Selangor were surveyed through either personal interview or self-administered questionnaire during the months of July through September 2000.

Respondents were randomly given either one of the two versions of the questionnaire. The large and small scope (30 and 10 per cent quality change, respectively) each represents approximately 50 per cent of all samples collected.

For each sample version (large and small scope), each of the four-posted prices used for the dichotomous-choice WTP question was randomly distributed. The number of respondents given a similar posted price varied from 24 to 31 respondents for each version of the questionnaire.

Respondent Profiling

Mean age of all respondents was 33 years with average monthly household income totaling RM2,539. Professional and management workers formed 24 percent of all respondents. Education wise, 48 percent of respondents had college or university level education.

Male respondents formed 57 percent of total respondents. Due to the rather lacked of cooperation among the non-Malays, the proportion of respondents in terms of ethnic groups was skewed towards the Malays (88 per cent).

In terms of respondents' attitude towards the environment in the face of conflicts affecting natural resource use and allocation, about 80 per cent of respondents indicated support for conservation in favor of resource conversion or development. However only 3 per cent were directly involved with environmental concerns through participation as members of societies related to the environment.

Concerns of wetlands issues in specific among respondents seemed to be minimal as more than 60 per cent of respondents ranked wetland in the 6th – 8th category when asked to compare among a list of 8 environmental issues which include extinction of species, air and water pollution, forest clearing, flash flood, solid waste management and soil erosion.

Only 32 per cent of respondents knew about Paya Indah prior to the survey, with the most sources of information about the site coming from the printing media, friends or family and electronics media (41, 46 and 32 percent, respectively). This is not surprising as the site was not yet open or promoted to the public at the time this survey was conducted. Almost all of respondents (96 per cent) indicated the possibility of arranging future visits to Paya Indah.

Response to Dichotomous-Choice (D-C) WTP Question

For each posted price, substantially fewer than 36 valid respondents were obtained from the rural areas. Hence, the analysis of dichotomous choice CV including the scope test utilized data from urban respondents only. See Table 1 for distribution of posted prices and sample sizes.

Table 1: Posted Price and Sample Versions (Urban Respondents)

Posted Price		Large Scope (30%)		Small Scope (10%)		Total number of respondents
		Freq.	%	Freq.	%	
RM	1	29	25.7	24	21.8	53
RM	5	27	23.9	30	27.3	57
RM	20	27	23.9	31	28.2	58
RM	50	30	26.5	25	22.7	55
TOTAL		113	100%	110	100%	223

Of all valid respondents from the urban areas (223), 69 per cent indicated positive responses (WTP) to the suggested posted price. However, this may not necessarily indicate the true willingness of respondents as the "warm glow effect" or 'yea saying' is possible. However, the distribution of 'yes' and 'no' responses among the different posted prices for the two split samples (Table 2) conform to expectation. It was shown that the higher the posted price, the lesser the number of those who agreed to pay. For instance, for posted prices RM1, 5, 20 and 50, the percentage of those willing to pay are 37.2, 32.1, 23.1 and 7.7, respectively.

Dichotomous Choice (CV)

Table 3 reports the results of the logistic model for the two split samples. This allows comparison to be made on the relationship between WTP and the rate of change in environmental quality as perceived by respondents.

Total sample size for analysis is reduced to 85 per cent (190 samples) from the initial 223 collected due to missing values. The overall performance of the 3 models is quite satisfactory with a good fit measure ranging from .76 to .87 (Count R2) and .3 to .5 (Mc Fadden R2). These values are comparable to other similar studies in the literature.

Table 2: Response to Dichotomous-Choice WTP Question

Given Posted Price (PP)		(Yes) WTP PP to avoid 30% fall in quality of Paya Indah		(No) Not WTP PP to avoid 30% fall in quality of Paya Indah		(Yes) WTP PP to avoid 10% fall in quality of Paya Indah		(No) Not WTP PP to avoid 10% fall in quality of Paya Indah		Respondents
		Freq.	%	Freq.	%	Freq.	%	Freq.	%	
RM	1	29	37.2	0	0	23	31	0	0	52
RM	5	25	32.1	2	5.7	27	36	4	11.4	58
RM	20	18	23.1	9	25.8	18	24	13	37.1	58
RM	50	6	7.7	24	68.6	7	9	18	51.4	55

TOTAL	78	100%	35	100%	75	100%	35	100%	223

The coefficient for price is negative as expected, showing that the higher the bid offered, the less likely the respondent is willing to accept the bid. For all models, bid price is significant at 1 per cent confidence level.

Apart from PRICE, only environmental concern (ENVT) is significant at the 2 and 5 percent confidence levels for models with large percentage change (model 1) and overall percentage change (model 3), respectively.

Coefficient for scope in the overall model is positively related to the likelihood of accepting the bid. To some extent, this shows that respondents are responsive to the rate of quality change described when answering the WTP question. However, the relationship is not statistically significant.

WTP estimation for the logistic model is represented by the area under the cumulative distribution function (CDF), explaining the relationship between the probability of accepting the bid to the bid offered. The shape of the CDF for this study conforms to theory. However, the results for the different models representing different scopes cannot be explained from the CDF obtained as the CDF for the large and the small scope models intersect one another. Figure 2 illustrates the functions for the 3 different models.

Calculating the area below the CDF yields the mean WTP estimate for each respondent. Each respondent in this model represents an urban household in Selangor; therefore, this monetary value when multiplied by the total number of urban households in the state and the ratio of respondents who are willing to pay will represent the aggregate WTP for the entire urban population.

Table 3: Maximum Likelihood Estimates of Logistic Regression

SCOPE	**REGRESSION COEFFICIENTS[a]**		
	Model 1 (10%)	**Model 2 (30%)**	**Model 3 (Overall)**
Variables:			
PRICE	-.072 (-4.235)***	-.120 (-5.000)***	-.090 (-6.923)***
AGE	-.015 (-.333)	-.043 (-.956)	-.024 (-.774)
INCOME	.000174 (1.074)	.000756 (.4.345)	.000137 (1.245)
ENVT	.963 (1.372)	2.000 (2.077)***	1.274 (2.329)*

EDU	-.231 (.387)	1.176 (1.429)	.267 (.562)
SCOPE	–	–	.416 (.965)
CONST	2.095 (1.599)	3.624 (2.338)**	2.437 (2.579)***
Count R^2	.79	.87	.82
Mc Fadden R^2	.27	.49	.36
N	93	97	190

a t-values in parentheses; ***, **, * denote significant at 1, 2, 5 percent levels, respectively.

In Table 4, calculated annual mean WTP for each respondent based on the previous CDF is shown. The values are RM27.50, RM30.93 and RM27.70 for models 1, 2 and 3, respectively. The result is plausible as it is consistent with expectation on scope (larger scope should yield larger WTP). Mean WTP is found to be slightly lower for the small scope (model 2) as compared to the large scope (model 1).

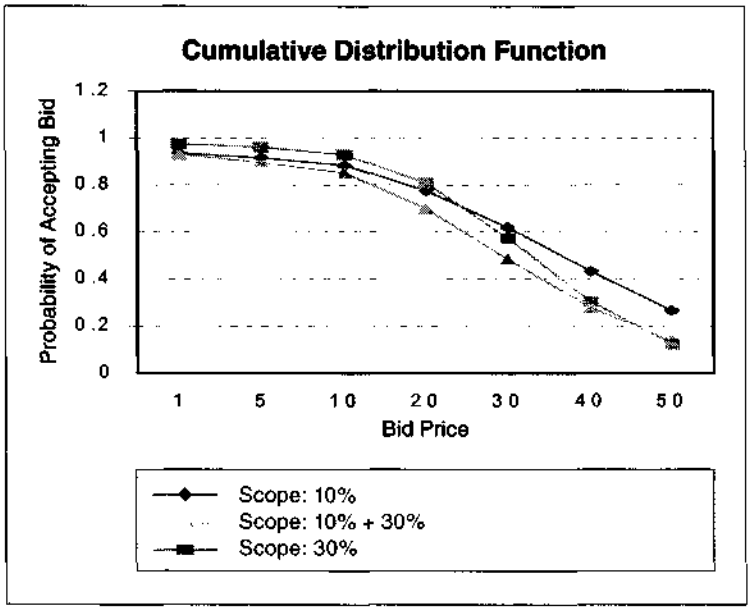


Figure 2: Cumulative Distribution Function Illustrating Equivalent Surplus WTP (3 Models)

Table 4: Average Mean WTP (Dichotomous choice CV) for Non–User Urban Households to Avoid a Decrease in the Environmental Quality of Paya Indah

Scope	Average WTP (RM)
10% (Model 1)	27.50
30% (Model 2)	30.93
Overall (Model 3)	27.70

Open Ended CV

Of total respondents, 341 respondents (75 percent) responded positively to the CV question. The majority of respondents who indicated a zero WTP argued that nature conservation is the responsibility of the government. Only about 2 percent of respondents were thought to provide a genuine protest bid.

About 52 percent of respondents stated a WTP ranging from RM1 – RM10, 19 percent from RM11-RM50, while only 3 percent of respondents revealed a WTP from RM51- RM120.

To validate the WTP responses, OLS regressions were performed on Equation 14 and the results depicted in Table 5. Overall the models depict an acceptable good of fit between 0.07 – 0.18 (AR2). The signs for all coefficients were consistent to our intuition. Generally, results show that the WTP levels were influenced significantly by income (INC) and posted price (PRICE). The positive sign of the coefficient for PRICE suggests that the predetermined posted price levels underestimated respondents' range of WTP. The coefficient for SCOPE is positive and significant, implying that respondents were willing to pay a higher amount to avoid a larger degradation in environmental quality relative to the smaller change, i.e., declining MRS between environmental change and the monetary attribute. The results also show that there were no difference in the level of average WTP between urban respondents and rural respondents.

Table 5: OLS Estimates for Open Ended CV

SCOPE	REGRESSION COEFFICIENTS[a]		
	Model 1 (10%)	**Model 2 (30%)**	**Model 3 (Overall)**
AGE	-.127 (-1.094)	0.0483 (0.214)	-0.0031 (0.255)
INC	0.00178 (3.043)***	0.0254 (2.284)**	0.002116 (3.505)***
EDU	0.358 (0.133)	-1.384 (-0.285)	-0.272 (-1.00)
ENVT	2.745 (1.118)	6.327 (1.437)	4.125 (1.668)*
PRICE	0.283 (4.641)***	0.228 (2.261)**	0.255 (4.313)***
SCOPE	–	–	3.986 (1.797)
SPLCAT	0.991 (0.393)	5.834 (1.252)	3.354 (1.297)

Adj. R^2	.179	0.071	0.119
DW	1.989	2.169	2.153
CI	11.825	13.02	12.96
N	172	173	345

a t-values in parentheses; ***, **, * denote significant at 1, 5, 10 percent levels, respectively.

In Table 6, calculated annual mean WTP for the open ended CV is presented. For the overall samples, mean WTP was found to be some RM15 per household. Similar to the dichotomous choice CV, the results are theoretically plausible as it is consistent with expectation on environmental change (larger scope should yield larger WTP). The mean WTP for rural respondents (RM6 – RM12) seems to be substantially lower than that of urban respondents (RM15 – RM20). However, the empirical results (Table 5) do not lend support for this apparent difference.

Table 6: Average Mean WTP (Open ended CV) for Non–User Households to Avoid a Decrease in the Environmental of Paya Indah.

Scope	Overall	Urban	Rural
10% (Model 1)	12.49	14.67	5.81
30% (Model 2)	17.31	19.68	12.09
Overall (Model 3)	14.94	17.23	9.59

The WTPs among urban respondents obtained from open-ended CV are generally lower compared to that of dichotomous choice CV (comparing Table 4 and 6). This is consistent with the findings in the literature.

Aggregation of Values

In deriving the aggregate values, we employ the conservative approach, i.e, by utilizing the mean WTP obtained from the overall samples in the open-ended CV.

Taking the average household size of 4.8 for Selangor with the state population size of some 3 million people (Malaysian Statistic Department, 1999), number of total households for the state is estimated at 625,000 units. The magnitude of aggregate non-use values would depend on the population size that derives this value type. From the survey, it was found that 95 percent of respondents indicated that they intent to visit Paya Indah sometime in the future. As Paya Indah is already accessible for public viewing currently, the above statistic suggests that only 5 percent of respondents may derive non-use values currently and in the future. Hence, by presuming that the non-use values for Paya Indah relate to only 5 percent of the population of Selangor, the aggregate non-use values for the state are calculated and shown in Table 7.

Table 7: Aggregate Current WTP* (Dichotomous choice CV) for Non–User Households to Avoid a Decrease in the Environmental Quality of Paya Indah

Scope	Aggregate WTP (RM)
10% (Model 1)	390,312
30% (Model 2)	540,625
Overall (Model 3)	466,875

* Average household size = 4.8; relevant population size = (3 mill/4.8)*0.05; Estimated number of relevant households = 31,250

Aggregate WTP for non-user households in Selangor is estimated at RM390,312, RM540,625 and RM466,875 for models 1 (large scope), 2 (small scope) and 3 (overall), respectively. As the reference population relates to only Selangor state households, the estimated values would represent the lower bound annual stream of social benefits (in terms of non-use values) for the maintenance of Paya Indah as a site for nature, presuming the number of non-user households and all other socio-economic and attitudinal variables in the state remain unchanged over the years.

Conclusion and Policy Implications

The aggregate lower bound current non-use values of maintaining the wetland as a nature sanctuary is estimated at RM466,875 (using the overall sample version) annually or RM4.7 million in terms of present value (based on a 10 percent social discount rate). The aggregate value is rather substantial considering that the value merely represents non-use values and only accruable to some 5 percent of households in Selangor and further by the restrictive presumption that the number of non-user households and all other socio-economic variables in the state would remain unchanged over the years.

The large sum of monetary value that urban households holds for the conservation of Paya Indah illustrates partially the magnitude of social benefits that society at large obtains from the assurance that the wetland is to be maintained as a site for nature. This strongly indicates that conservation of Paya Indah wetlands is highly valued by the general public.

The implication of study is important especially when considering the rate at which our natural resources are being depleted to meet development needs. The study depicts how environmental valuation exercise can make a difference when deliberating whether or not a particular natural resource is to be converted to alternative uses.

For Paya Indah, the result of this study provides an economic ground for its management's effort as well as the policy makers' decision to continue maintain-

ing the area as a wetland sanctuary. The result of study may also be incorporated in the economic analysis for determining the viability of conserving the area in the long run. Further, the estimated benefits obtained from this study (source) may be transferred to other similar (target) wetlands site for the purpose of policy or management decisions affecting the target resource.

REFERENCES

Hanemann, W. M. 1984. Welfare evaluations in contingent valuation experiments with discrete responses. American Journal of Agricultural Economics. 66 (3): 332-341.

Jamal Othman and Redzuan Othman (1998). "Economic Benefits from Wetland Biodiversity: Case of Fireflies Recreation, Malaysia". Tropical Biodiversity 5(1):65-74.

Jamal Othman (2000). "Benefits of Wetland-Based Recreation: Case of Kuala Selangor Nature Park and Fireflies". Malaysian Journal of Environmental Management. Vol. 1:41-54.

Jamal Othman (2001). "Estimating Non-Use Values of Environmental Resources Using Contingent Valuation: Case of Matang Mangroves". In Jamaluddin Jahi, et. al. (eds). Environmental Management 2000. Center for Graduate Studies, Universiti Kebangsaan Malaysia, Dec. 2001: 214-222.

Kaplowitz, M.D. & Hoehn, J.P. 1998. Using focus groups and individual interviews to improve natural resource valuation: Lesson from the mangrove wetlands of Yucatán, Mexico. Early draft. Paper presented for the 1998 World Congress of Environmental and Resource Economists, Venezia, Italy. Online.

Loomis, J., Lockwood, M. & DeLacy, T. 1993. Some empirical evidence on embedding effects in contingent valuation of forest protection. Journal of Environmental Economics and Management. 25 (1): 45-55.

Malaysian Wetlands Foundation, Kuala Lumpur. 1996. Preliminary Ecological Assessment of the Malaysian Wetland Sanctuary, Selangor.

Malaysian Statistics Department 1999. Buku Tahunan Perangkaan Malaysia 1999. September, Kuala Lumpur.

Pearce, D., Whittington, D., Georgiou, S. & Moran, D. 1994. Economic values and the environment in the developing world. Report to the United Nations Environment Programme, Nairobi. Environmental Economics Series. No. 14. London: The Centre for Social and Economic Research on the Global Environment (CSERGE).

Shuib, A. 1991. "Effects of Time Cost on Recreational Benefit Estimation". Malaysian Journal of Agricultural Economics. Vol. 8, 41-51.

Stevens, T.H., Echeverria J., Glass, R.J., Hager, T. & More, T.A. 1991. "Measuring the Existence Value of Wildlife: What Do CVM Estimates Really Show?". Land Economics. 67 (4): 390-400.

Seller, C., Stoll, J.R. & Chavas, J-P. 1985. Validation of empirical measures of welfare change: A comparison of nonmarket techniques." Land Economics. 61(2): 156-174.

Willis, K., G. Garrod and T. Chee (1998). 'Valuation and Analysis of Consumer Demand for Forest Recreation Areas in Peninsula Malaysia'. In S. Lee, D. May, I. Gauld and J. Bishop (eds). Conservation, Management and Development of Forest Resources. Proceedings of the Malaysia-UK Programme Workshop. Forest Research Institute Malaysia.

3 Migration in The New Millenium

Baayah Baba
Faculty of Business Management,
Universiti Teknologi MARA.

Abstract

Migration plays an important role in many economies. It helps in moving labour from rural to urban areas, the former is labour rich while the latter is job rich. The conventional migration models were claim by researchers to be useful in determining regional migration. Selected models were regress using the Scottish-RUK data. The research findings does not support the notion that people move as a response to better wages but it does support the notion that people move because of available employment. Previous migration behaviour seems to have positive effect on current migration behaviour.

Keywords:
Migration, conventional models, wages, employment.

INTRODUCTION

Migration plays an important role in many economies. It helps in moving labour from rural to urban areas, the former is labour rich while the latter is job rich. Inter-regional movements of capital and labour play a critical role in theories of regional development and growth. The factor flow that I am concerned with is the flow of labour. Labour migration is a more complex phenomenon than flows of capital, and this may account for the many theories of migration that have been developed. In this paper I begin by discussing the conventional migration models which were claim by researchers to be useful in determining regional migration. I regress these models using the Scottish-RUK data to see whether such models do explain the Scottish-RUK migration pattern.

THE CONVENTIONAL MODELS OF MIGRATION

The Layard, Nickell and Jackman (LNJ, 1991) migration model include the real wage, the unemployment rate and the price differentials between regions as determinants of in-migration. But stresses the importance of the real wage and unemployment rate differentials in influencing migration decisions. Thus relative to our studies their finding suggest that the higher the real wage in Scotland relative to RUK fewer people will migrate from Scotland to RUK. Likewise the lower the unemployment rate in Scotland relative to RUK, fewer people will out-migrate from Scotland to RUK.

The LNJ in-migration function is as follows:

$$M_i = b_1 \log \left[\frac{\frac{N_i}{L_i}}{\frac{N}{L}} \right] + b_2 \log \left[\frac{W_i}{W} \right] b_3 \log \frac{P}{P_i} + b_{4i}$$

and for estimation purposes is given as,

$$\frac{M}{L} = b_1 (u - u_i) + b_2 (w_i - w) + b_i (p - p_i) + b_{4i}$$

where p refers to house prices; u and u_i are the unemployment rates in the two regions; w and W_i are the real wages. My regression model follows the LNJ model closely as they claim their model works for the UK in general.

The Ermisch (1995) migration model focuses on the relative real wage and relative employment rate, lagged one period, as the main determinants of net migration between Ireland and Great Britain. He tried to explain the degree of responsiveness of migration to real wage differentials by examining the size and pattern of European migration and whether there has been convergence in real wages. He found low responsiveness to real wage differentials, which "could be interpreted as large compensating differentials." (Ermisch, 1995). Similar to many other studies they found that migration is more sensitive to unemployment differentials between regions (and countries) than real wage differential.

Jackman and Savouri (1992) model relate migration as a special case of job-matching in which a job-finder in region A is matched to a job in region B. Although people can live in one area and work in another (Jackman and Savouri 1992), more often than not, such job match usually involves migration of the household. Thus migration is viewed as the result of successful job search but not a pre-condition for it; as available information technology makes it easy for job-finder to look for a job without having to "physically relocate" himself. Their finding suggest there

will be a higher rate of out-migration from regions of high unemployment. The unemployed people are more likely to move.

MODEL ESTIMATIONS

Here I seek to estimate net migration rate equations on Scottish-RUK data. A number of authors have claimed to find specifications which fit U.K regional data well (for example LNJ; 1991, Jackman and Savouri; 1992, while Ermisch; 1995 claim to explain the Irish to UK data). Using microfit and employing the OLS1[1] regression I examine the performance of these models on a different data set from that used by each of the authors. Availability of data is the main motivation for the use of the Scottish-RUK data. My research finding does not support the notion that people move as a response of better wages but the result does support the hypothesis that people migrate from high unemployment region to low unemployment region. The result also indicates that the previous migration behavior will encourage current migration behavior.

The Ermisch Model

The result of regressing the Ermisch model (1995) on Scottish-RUK data is shown as equation 1 of Table 1. Equation 1 shows that the Ermisch unmodified model does not provide a very good explanation of Scottish RUK migration behavior.

Table 1: Dependent variable is NMGRATE. Sample period 1970-1994.

Variable	Equation 1	Equation 2	Equation 3
Intercept	.0019 (2.59)	.0011 (1.85)	.0053 (1.63)
$(rw_S\text{-}rw_{RUK})t\text{-}1$	.0398 (2.67)	.0223 (1.81)	0233 (1.08)
$[(1\text{-}U_S)\text{-}(1\text{-}U_{RUK})t\text{-}1$	.0014 (1.55)	.1267E-3 (0.16)	-.4089E-3 (0.21)
NMGRATE(t.1)	–	.6601 (3.91)	–
T	–	–	-.9978E-4 (1.06)
R-Squared	0.27	0.59	0.31
R-Bar-Squared	0.20	0.52	0.21
DW Statistic	0.78	–	0.78
Durbin's h-stats	–	0.69	–

1 The OLS is the simplest reliable form of estimation.

S.E	.0014580	.6811E-3	.0014537
Diagnostic Tests			
Serial Correlation CHI-SQ(1)	7.9814[.005]	.36670[.545]	9.7388[.002]
Functional Form CHI-SQ(1)	12.5401[.000]	.075472[.784]	12.3388[.002]
Normality CHI-SQ(2)	1.0031[.606]	.061116[.970]	1.7154[.424]
Heteroscedasticity CHI-SQ(1)	4.9784[.026]	5.9460[.015]	3.3173[.069]

The relative real wage variable is significant at the 5 per cent level, as shown by the t-value that is higher than the critical t-value, but has the opposite sign to that expected. Here net out-migration is denned to be positive in the dependent variable. The implication is that the higher the real wage in Scotland the greater the number of people who leave Scotland for the RUK, whereas theory predicts the reverse. The employment differential between Scotland and the RUK does not have the expected positive sign and it is not significant at the 5 per cent level. The R2 value of only 0.27 implies the model explains very little of the migration behavior between Scotland and RUK over the period. The DW-statistic of 0.78 indicates the likely presence of serial correlation that is confirmed by the Lagrange multiplier test of residual serial correlation, which rejects the null hypothesis of no serial correlation. The diagnostic test results also indicate that normality and heteroscedasticity problems are present. Given these results I conclude that the basic Ermisch model is not a suitable model for explaining Scottish-RUK migration data.

Next, in equation 2 of Table 1,1 regress the original Ermisch model but this time the lagged dependent[2] variable is included. The results do not improve much as a consequence. Only the lagged dependent variable is significant at the 5 per cent level. The positive sign on the parameter indicates that previous migration magnitude does encourage more migration in the current period. The larger the magnitude of previous migration the more people will migrate from Scotland to RUK. This result is compatible with a "partial adjustment" interrelate of aggregate migration flows.

The $R^{\bar{2}}$ value hasimproved so that the Scottish-RUK migration data are better explained by equation 2 than equation 1 but the signs on the key variables remain unexpected. The diagnostic test results do not show evidence of serial correlation or of functional form problems in the model.

In equation 3 of Table 11 regress the Ermisch model with the time trend included. None of the variables are significant at the 5 per cent level. The standard error of regression increases from the previous migration equation and the R2 value declines to 0.31. Equation 3 explains the Scottish-RUK migration data less

2 By including the lagged dependent variable as a regressor the serial correlation problem could be eliminated (as suggested by Johnston 1984).

well than equation 2. The diagnostic test results also provide evidence of serial correlation and functional form problems. Given these results I conclude that equation 3 provides an inadequate explanation of Scottish-RUK migration behavior.

I now estimate further augmented versions of the Ermisch model. We start by regressing up to the second lag of the variables used in the Ermisch model and also include the lagged dependent variable. I report only three of the models that we think are worth discussing in Table 2.1 also include the time trend in our regression but find that when the lagged dependent variable and the time trend are regressed in the same equation both the variables fail to be significant at the 5 per cent level. I then drop the time trend from the regression since the results suggest that it is better to include the lagged dependent variable separately from the time trend. When the time trend is regressed with other variables without the lagged dependent variable the results obtained are not
convincing thus I do not report them here.

In equation 1,1 regress the relative real wage and employment differentials up to their second lags and the lagged dependent variable. None of the variables, apart from the intercept, is significant at the 5 per cent level. Then I conduct the variable deletion test to exclude the lagged values of the relative real wage variable. The test results imply that the variable can legitimately be omitted from the regression. The result of the regression is given by equation 2 of Table 2. The relative real wage is significant at the 5 per cent level as reflected by the t-value that is higher than the critical t-value, but it does not have the expected sign. Thus the result does not support the hypothesis that people move from low wage origins to high wage destinations. The employment differentials are not significant at the 5 per cent level. The lagged dependent variable is significant at the 5 per cent level. The positive sign indicates that the previous migration behavior will encourage current migration behavior. This shows the partial adjustment[3] in the migration process. Next we omit the current employment differential and its first lag from our model, which are statistically acceptable, and the result is as shown by equation 3 of Table 2. The relative real wage variable remains significant at the 5 per cent level and maintains the sign opposite to what theory predicts. The employment differential remains insignificant at the 5 per cent level, implying that the Scottish-RUK migration behavior is not affected by the relative employment rates between the two regions.

3 The partial adjustment can be described in terms of different perception lags as follows.
$nm_t\ nm_{t-1} = \lambda\ (nm_t^* - nm_{t-1})$

Table 2: Dependent variable is NMGRATE. Sample period 1970-1994.

Variable	Equation 1	Equation 2	Equation 3
Intercept	.0018 (2.44)	.0018 (2.64)	.0016 (2.51)
$(rw_S\text{-}rw_{RUK})_t$	.0290 (0.05)	.0293 (2.48)	.0256 (2.42)
$(rw_S\text{-}rw_{RUK})_{t-1}$	.0030 (0.05)	–	–
$(rw_S\text{-}rw_{RUK})_{t-2}$	-.0032 (0.07)	–	–
$[(1\text{-}u_s)\text{-}(1\text{-}u_{RUK})]_t$	-.6113E-3 (0.23)	-.5346E-3 (0.23)	–
$[(1\text{-}u_s)\text{-}(1\text{-}u_{RUK})]_{t-1}$	.0021 (0.80)	.0020 (0.88)	–
$[(1\text{-}u_s)\text{-}(1\text{-}u_{RUK})]_{t-2}$	-.0024 (1.11)	-.0023 (1.58)	-.9245E-3 (1.34)
$NMGRATE_{(t-1)}$	.66011 (1.94)	.64847 (2.86)	.70447 (4.98)
R-Squared	0.66	0.66	0.64
R-Bar-Squared	0.51	0.57	0.58
DW Statistic	–	–	–
Durbin's h-stats	0.73	0.73	0.62
S.E	.0011484	.0010790	.0010556
Diagnostic Tests			
Serial Correlation CHI-SQ(1)	.99365 [.319]	.83898 [.360]	.004043 [.949]
Functional Form CHI-SQ(1)	.36123 [.548]	.32232 [.570]	.020211 [.887]
Normality CHI-SQ(2)	.96749 [.616]	1.0736 [.585]	.59068 [.744]
Heteroscedasticity CHI-SQ(1)	3.278 [.070]	3.2985 [.069]	4.4677 [.035]

The lagged dependent variable shows a stronger positive influence on the net out migration behavior between Scotland and RUK. The R2 value of 0.64 implies that the model explains 64% of the variation in the Scottish-RUK migration data. The diagnostic test result shows there is no evidence of serial correlation or functional form problems. Considering the test of skewness and kurtosis of residuals the result supports the null hypothesis: the residuals are normally distributed.

From the above findings I conclude that the augmented versions of the Ermisch model do not provide very good explanations of the Scottish-RUK migration data. But it does stressed the importance of previous migration behavior in encouraging current migration behavior.

The Layard et. al. Model

In this section we estimate the Layard et. al. (1991), also known as LNJ, model in its original and augmented form on Scottish-RUK migration data. I first spell out the model and then discuss the results of the regressions.

The LNJ (1991) is very much similar to the Ermisch (1995) model except that the LNJ model uses the unemployment differential variable instead of the employment differential, and the LNJ model also include price differential in their model but Ermisch (1995) does not.

The LNJ (1991) estimated model is given as follows:

$$M_i / L, = \underset{(2.7)}{O.OS1}(u-u_i) + \underset{(3.9)}{0.058}(w_i-w) + \underset{(1.6)}{0.010}(p-p_i) + b4; \quad (3.2)$$

(Standard error = 0.0031)

Where u is unemployment rates, w is real wages, p refers to house prices. All dependent variables are in natural logarithm. The above model is quite consistent with the idea that real wages and the unemployment rates have the same proportional effect on migration. Higher wages and better job opportunities both encourage migration into and area with almost the same intensity while lower housing prices do encourage migration to a lesser extent.

Table 3: Dependent variable is NMGRATE. Sample period 1970-1994.

Variable	Equation 1	Equation 2	Equation 3
Intercept	.0016 (2.12)	.0027 (0.77)	.0014 (1.71)
$(rw_s - rw_{RUK})_t$	.0457 (2.76)	.0431 (2.31)	.0352 (1.67)
$(u_s - u_{RUK})_t$	.0035 (2.87)	.0272 (0.97)	.0011 (0.72)
$(_{Ps} - P_{RUK})_t$	-.0059 (1.81)	-.0067 (1.61)	-.0030 (0.70)
NMGRATE $(_{t-1})$	–	–	.5358 (1.95)

T	–	-.3116E-3 (0.33)	–
R-Squared	0.40	0.40	0.57
R-Bar-Squared	0.31	0.28	0.48
DW Statistic	0.92	0.89	–
Durbin's h-stats	–	–	None
S.E	.0013103	.0013406	.0011617
Diagnostic Tests			
Serial Correlation CHI-SQ (1)	8.4054[.004]	11.9609[.001]	2.8660[.090]
Functional Form CHI-SQ (1)	.782229[.376]	1.0872[.297]	.009649[.922]
Normality CHI-SQ (2)	1.2449[.537]	1.5851[.453]	1.1637[.559]
Heteroscedasticity CHI-SQ (1)	.011167[.916]	.11208[.738]	.95139[.329]

The result of regressing the Layard et, al. model in its original form is given by equation 1 of Table 3. The real wage differential between Scotland and RUK is significant at the 5 per cent level but the result does not support the hypothesis that people migrate from low real wage to high real wage regions. The unemployment differential between Scotland and RUK is also significant at the 5 per cent level and has the expected sign. It supports the hypothesis that people move from high unemployment to low unemployment regions. The price differential variable is not significant at the 5 per cent level and does not have the expected sign. The R2 value of 0.40 means the model only explains 40% of Scottish- RUK migration behavior. The DW statistic and the diagnostic test on serial correlation indicate that serial correlation might be present. The diagnostic test on functional form however does not provide evidence of the functional form problem being present. Neither the hypothesis that the residuals are normally distributed nor the hypothesis that there is homoscedasticity is rejected.

Next I regress equation 1 with the time trend variable included as a regressor. The time trend variable is not significant at the 5 per cent level. The real wage differential remains significant at the 5 per cent level and maintains the perverse sign. With the inclusion of the time trend variable in the regression, the unemployment differential is no longer a significant regressor although it maintains the expected sign. The relative price differential is not significant at the 5 per cent level and has the opposite sign to that predicted by theory. The R2 value has not changed which implies that equation 2 is no better than equation 1 in explaining why people migrate from Scotland to RUK. While R2 indicates lower tone explanatory power. The diagnostic results provide similar explanation as mention for equation 1.

Next I include the lagged dependent variable as a regressor and still maintain the previous regressors except for the time trend. The result is as given by equation 3 of Table 3. In general the explanatory power of the variables has declined. None of the variables used in the regression is significant at the 5 per cent level.

Although the R2 has improve a little and the diagnostic test results implies that the model may be a better model than equation 1 and equation 2, the fact that none of the variables used in the regression are significant at the 5 per cent level leads us to conclude that equation 3 is not capable in explaining Scottish-RUK net migration data. Hence I also conclude that Layard et. al. model, augmented by the inclusion of the time trend variable and the lagged dependent variable is incapable of explaining Scottish-RUK net migration.

Then I augment Layard et. al. model to see whether the inclusion of other lags of the variables used in the regression can help to improve its explanatory power. I start with the general form of the model which includes the current, first lags and second lags of the real wage differential, unemployment differential and the price differential between Scotland and RUK. I also include the lagged dependent variable as a regressor to see how previous migration affects current migration behavior. The result shows that all the variables except the price differential are insignificantly different from zero at the 5 per cent level. I then undertake the variable deletion tests to arrive at more parsimonious models. The results are reported in Table 4. In equation 1 of Table 4 the real wage differential between Scotland and RUK is shown to be significant at the 5 per cent level but has the opposite sign to that predicted by theory. The current unemployment differential is not significant at the 5 per cent level but the unemployment differential lagged two periods is very close to being significant but again does not have the expected sign.

Table 4: Dependent variable is NMGRATE. Sample period 1970-1994.

Variable	Equation 1	Equation 2	Equation 3
Intercept	.0029 (3.25)	.0022 (2.89)	.7604E-3 (1.29)
$(rws - rwRuK)_t$	.0484 (2.29)	.0304 (1.79)	.0045 (0.34)
$(u_s - u_{RUK})_{t-2}$	.0030 (1.38)	–	-.8620E-3 (0.60)
$(u_s - u_{RUK})_{t-2}$	-.0031 (2.06)	-.0014 (1.58)	–
$(P_S - P_{RUK})_{t-2}$	-.0106 (2.99)	-.0089 (2.60)	–
$(P_S - PRUK)_{t-2}$	0061 (1.99)	.0080 (2.90)	.0061 (2.19)
$NMGRATE((_{t-1})$	-.0035 (0.01)	.2569 (1.46)	.6662 (3.51)
R-Squared	0.81	0.79	0.69
R-Bar-Squared	0.73	0.72	0.62
DW Statistic	–	–	–

Durbin's h-stats	none	1.09	0.48
S.E	.8256E-3	.8484E-3	.0010052
Diagnostic Tests			
Serial Correlation CHI-SQ(1)	.094203[.759]	.027059[.869]	.017319[.895]
Functional Form CHI-SQ(1)	1.3021 [.254]	3.1810[.074]	.20585[.650]
Normality CHI-SQ(2)	.29127[.864]	1.1578[.561]	1.2770[.528]
Heteroscedasticity CHI-SQ(1)	2.0591[.151]	1.8440r[.l74]	.76821[.381]

The current price differential is also significant at the 5 per cent level but does not support the hypothesis that people move from high price regions to low price regions. The lagged dependent variable is not significant at the 5 per cent level. The R2 value of 0.81 implies that the equation tracks Scottish-RUK net migration flows data[4] reasonably well. The diagnostic test results do not provide evidence of either serial correlation or a functional form problem. Tests also show that the null hypothesis that the residuals are normally distributed is not rejected and there is no evidence of heteroscedasticity.

Next in equation 2 of Table 4 I find that omitting the current unemployment differential does not yield much improvement. Only the price differential variables are significant at the 5 per cent level but the parameters are almost equal in magnitude and have signs opposite to one another. The lagged dependent variable remains insignificant at the 5 per cent level. Next I regress the net migration rate on the current real wage differential, the current unemployment differential and the second lagged of the price differential together with the lagged dependent variable.

Only the second lag of the price differential and the lagged dependent variables are significant at the 5 per cent. The price differential in period (t-2) has the expected positive sign. This suggests that the higher are house prices in Scotland relative to RUK two years ago the more people leave Scotland for RUK. The positive sign on the parameter of the lagged dependent variable indicates that the higher the number of people migrating from Scotland to RUK in the previous period will encourage more people to leave Scotland in the current period. The R2 value of 0.69 indicates that equation 3 explains 69% of the Scottish-RUK migration data. The diagnostic test results provide no evidence of serial correlation, functional form problems, non-normally distributed residuals or heteroscedasticity.

The Jackman and Savouri (1992), J&S preferred equation for net migration is given as:

4 The high R2 value might be due to more variables being used in the regressions than before, as increase inn the number of variable used always increase R2 but not R-bar-squared.

$$m_i^{net} F_i - 3.2\,(u_i - u) + 16.5\,(v_i - v) - 0.56 \ln (PH_i / PH)$$
$$(3.4) \qquad (2.2) \qquad (5.3)$$

where F are regional fixed effects; u and v are natural logarithm of unemployment and vacancy rates respectively and PH are house prices. Notice that wage effects are not defined in J&S (1992) model unlike the Ermisch (1995) and the LNJ (1991) migration models.

Initially I estimate the J&S model in its original form (see equation 1 of Table 5), later we include the lagged dependent variable (as in equation 2 of Table 5) and the time trend (as in equation 3 of Table 5) as regressors. The results of equation 1 show that the unemployment differential is significant at the 5 per cent level but the sign is contrary to expectations. The vacancy differential is also significant at the 5 per cent level which supports the hypothesis that the higher the vacancy rate in Scotland the less the number of people leaving Scotland for RUK. The price differential does not seem to have any effect on the net out migration rate. The R2 value of 0.69 implies the model explains 69% of the data. The DW statistics and the diagnostic test on serial correlation do not provide evidence of a serial correlation problem. There is also no evidence of functional form or heteroscedasticity problem. The diagnostic test result indicates that the null hypothesis that the residuals are normally distributed is not rejected.

In equation 2 the unemployment rate differential is significant at the 5 per cent level and maintains the perverse sign. A high unemployment rate in Scotland relative to RUK does not seem to encourage net out migration from Scotland to RUK. The price differential remains insignificant in the regression. The vacancy differential remains significant at the 5 per cent level (but has a higher standard error than before) and maintains the expected sign. The lagged dependent variable is not significant at the 5 per cent level. The R2 implies that 73% of the variation in Scottish-RUK data is explained by the equation. The standard error has decreased which means equation 2 fits the data slightly better than equation 1.

The results for equation 3 show that the unemployment differential remains significant at the 5 per cent level and maintains the perverse sign. The price differential variable remains an insignificant regressor. The vacancy rate differential remains significant at the 5 per cent level and has the expected sign.

Table 5: Dependent variable is NMGRATE. Sample period 1970-1994.

Variable	Equation 1	Equation 2	Equation 3
Intercept	-.0154 (5.80)	-.0123 (3.78)	-.1233 (3.22)
$(u_S - u_{RUK})_t$	-.0031 (2.61)	-.0037 (2.64)	-.0045 (2.34)

$(p_S-p_{RUK})_t$	.0022 (1.11)	.0031 (1.55)	.5928E-3 (0.19)
$(VS-V_{RUK})_t$	-.0076 (5.82)	-.0062 (3.87)	-.0074 (5.41)
$NMGRATE_{(t-1)}$	–	3412 (1.61)	–
T	–	–	-.4191-4 (0.66)
R-Squared	0.69	0.73	0.70
R-Bar-Squared	0.65	0.67	0.64
DW Statistic	1.88	–	1.84
Durbin's h-stats	–	None	–
S.E	-9388E-3	.9229E-3	-9523E-3
Diagnostic Tests			
Serial Correlation CHI-SQ(1)	.078286[.780]	.84674[.357]	,13324[.715]
Functional Form CHI-SQ(1)	2.06664[.151]	44311 [.506]	2-6069 [-106]
Normality CHI-SQ(2)	.54540[.761]	.103251.950]	2.0049[.367]
Heteroscedasticity CHI-SQ(1)	1.7824[.182]	2.2479[-134]	.95062[.330]

The inclusion of the time trend variable as a rcgressor seems to increase the explanatory power of the vacancy differential variable, although the time trend itself is not a significant regressor. The model explains some 70% of the Scottish-RUK data. The standard error of regression increases a little which implies that equation 3 may not be quite as good a fit as equation 2 or equation 1. There is no evidence of serial correlation or functional form problems. The diagnostic test result indicates that the residuals are normally distributed and the function is homoscedastic. Next we check for parameters' stability using the CUSUM and CUSUM-SQ test for all the 3 equations discussed in above. The results suggest the stability of the parameters as all the residuals are within the given critical bands.

I further augment the J&S model to include other lags, a lagged dependent variable and the time trend as regressors. Many different combinations of the variables are regressed but only those that I think are among the best are recorded in Table 6. In equation 1 the unemployment differential at (t-1) is significant at the 5 per cent level but still maintains the sign opposite to that predicted by theory- The current price differential is not significant at the 5 per cent level but the price differential at (t-2) period is significant and has the expected sign. This implies that the higher the prices in Scotland two years ago the greater migration from Scotland to RUK in the current period. The vacancy differential is significant at the 5 per cent level and has the expected sign.

The result thus supports the hypothesis that, as the vacancy rate in Scotland increases relative to RUK, fewer people will migrate from Scotland to RUK. The

higher vacancy rate implies that more jobs are available hence there is no need for people to migrate out of Scotland to look for a job (assuming that job hunting is one of the main reason why people move). The lagged dependent variable is not significant at the 5 per cent level. The R2 value implies the model explains 81% of the variation in the dependent variable. There is no evidence of serial correlation or functional form problems. The diagnostic test results do not reject the null hypotheses of normality and homoscedasticity in the residuals.

Table 6: Dependent variable is NMGRATE. Sample period 1970-1994.

Variable	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Intercept	-.0097 (2.13)	-.0108 (3.01)	-.0080 (2-18)	-.0141 (4.09)	-.0174 (3.58)
$(u_S-u_{RUK})_t$	–	–	-.0028 (1.79)	–	-.0017 (0.81)
$(u_S-u_{RUK})_{t-1}$	-.0042 (2.62)	-.0028 (3.02)	–	-.0072 (4.49)	–
$(p_S-p_{RUK})_t$	-.9775E-3 (0.31)	–	–	–	–
$(v_S-v_{RUK})_{t-1}$	–	–	.0079 (3.67)	.0057 (2.21)	.0110 (3.43)
$(p_S-p_{RUK})_{t-2}$	.0083 (3.23)	0075 (4.27)	–	–	–
$(vs-v_{RUK})_{t-1}$	-.0052 (2.33)	-.0056 (3.18)	-.0041 (2.27)	-.0085 (7.53)	-.0073 (4.05)
$NMGRATE_{(t-1)}$	.0940 (0.46)	.1291 (0.65)	.5650 (2.88)	–	–
T				-.6666E-4 (1.27)	.6622E-4 (1.03)
R-Squared	0.81	0.80	0.72	0.81	0.62
R-Bar-Squared	0.75	0.76	0.66	0.77	0.54
DW Statistic	–	–	–	2.06	1.19
Durbin's h-slats	0.26	0.39	0.93	–	–
S.E	.8160E-3	.8088E-3	-9528E-3	.7870E-3	.001111
Diagnostic Tests					
Serial Correlation CHI-SQ(1)	.26945 [.604]	.15051 [-698]	.95487 [-328]	-06116 [.805]	4.4479 [.035]
Functional Form CHI-SQ(1)	3.8553 [.050]	1.3736 [.241]	.13203 [-7161]	.51726 [.472]	2.1582 [-1421

Normality CHI-SQ(2)	.72596[.696]	-24895 [-883]	.72011[.698]	2.1684 [-338]	.007002 [.9971
Heteroscedas-ticity CHI-SQ(1)	-13399[.714]	.14460 [.704]	1.8232 [.1771]	.0674[.302]	2.0626 [-151]

I conduct the variable deletion test and eliminate the current price differential from the regression. The result of the test indicates that the chosen variable can be omitted from the regression. I then regress the new model and the result is as shown by equation 2 of Table 6. In equation 2 the unemployment differential at period (t-1) remains significant at the 5 per cent level and maintains the perverse sign. The price differential in period (t-2) remains significant at the 5 per cent level and maintains the expected sign. The vacancy differential at period (t-1) also remains significant at the 5 per cent level and also has the expected sign. The t-value for the vacancy differential at period (t-1) is also higher than before. The lagged dependent variable however remains insignificant. The standard error falls a little and there is no evidence of serial correlation or functional form problems. The diagnostic tests do not reject the null hypotheses of normality and homoscedasticity in the residuals. Equation 2 therefore explains the Scottish-RUK migration processes reasonably well.

Next in equation 3 I replace the unemployment differential variable lagged one period by the current unemployment differential variable as a regressor to see whether the latter has an influence (or greater influence) on net out migration behavior. The result shows that the current unemployment differential is not significant at the 5 per cent level but still maintains the perverse sign. The price differential at period (t-1) is significant at the 5 per cent level and has the expected sign. The vacancy differential at period (t-1) also remains significant at the 5 per cent level and has the expected sign. The lagged dependent variable is now significant at the 5 per cent level. The positive sign indicates that as the magnitude of migration in the previous year increases, the current migration magnitude will also increase, as would be implied by a partial adjustment mechanism. The R2 value decreases a little which indicates that equation 3 is not a better fit than equation 2. The standard error of regression also increases which also indicates that equation 3 is no better than equation 2 at explaining the data. There is no evidence of serial correlation or functional form problems. The diagnostic tests results do not reject the null hypotheses of normality and homoscedasticity in the residuals.

Next I vary the model to include the time trend as a regressor. In equation 4 the unemployment differential lagged one period remains significant at the 5 per cent level and continues to take "wrong" sign. The price differential lagged one period is also significant at the 5 per cent level and has the expected sign (but has a lower t-value than in equation 3). The significance of the vacancy differential lagged one period has greatly increased and also maintains the expected sign.

Thus in this model the migration from Scotland to RUK is largely explained by the vacancy rate and house prices differentials between Scotland and RUK. The higher the vacancy rate in Scotland relative to RUK the fewer people will migrate from Scotland to RUK. The time trend variable is not significant at the 5 per cent level. The model explains 81% of the variation in the dependent variable. The DW statistics and the diagnostic test result suggest that serial correlation is not present. There is evidence that the functional form is correct. The diagnostic test result does not reject the null hypotheses of normality and homoscedasticity in the residuals. I then conduct the test for parameter stability for all the equations mention for Table 6 thus far. The CUSUM and CUSUM-SQ results indicate that parameter's stability prevails in equation 1 through equation 4.1 tried to augment the J&S model further, but the results did not improve. For example, as shown by equation 5 of Table 6, the explanatory power of the model declines and the serial correlation problem appears.

From the above findings I conclude that only the unemployment rate and vacancy rate variables have significant effect on net out migration behavior between Scotland and RUK when regressed individually.

FUTURE RESEARCH, AND CONCLUSIONS

Even in the new millennium migration has been a feeder process that relocates people from labour intense region to labour poor region. Migration within a region usually takes place because of economic reason of finding a job and also to improve living standards. However there are also other reasons why people migrate. This include moves induced by marriage; migration because of education, people also move because of health reason. In any case the decision to migrate is finally made after due considerations of the costs[5] and returns. If the returns outweigh the costs migration will take place if not people stay where they are. m my research above real wage differential seems to have the sign opposite to the norm. however the unemployment differential and job vacancies follows that of the literature. Here I can conclude that real wage is not as important as the availability of jobs in determining whether potential migrants make decision to migrate or not. However past migration behavior do have positive effects on current migration behavior.

It is my intention to research the determinants of migration between East and West Malaysia. I suspect the real motivation will be economic in nature but I do not play down the importance of education and marriage as the determinants of migration between the regions.

5 The costs include both pecuniary and non-pecuniary costs. Travel costs and maintenance costs while getting a new job constitute the pecuniary costs. While the non-pecuniary cost include the stress of leaving behind families and adjusting in the new surrounding.

REFERENCES

Adams, D.W. (1980a) "Migration From Scotland to the Rest of The United Kingdom." ESU Discussion Paper No. 10. Scottish Economic Planning Department.

Adams, D.W. (1980b) "Migration From Scotland to the Rest of The UK Revisited." ESU Discussion Paper No. 11. Scottish Economic Planning Department.

Baldwell, J. (1969), "African Rural-Urban Migration : The Movement to Ghana's Towns.", pp. 60-65.

Baldwin, R. and A.J. Venables, (1994) "International Migration, Capital Mobility and Transitional Dynamics.", Economica. vol. 61, pp. 285-300.

Blanchflower, D.G. and Oswald, A. (1994) "The Wage Curve" MIT Press, Cambridge, Mass.

Bover, 0., Muellbauer, J. and Murphy.A. (1988) "Housing, Wages and UK Labour Markets" CEPR Discussion Paper 268. cited in Harrigan et. al.

Bowles, S. (1970) "Migration as Investment: Empirical Tests of the Human Investment Approach to Geographical Mobility." The Review of Economics and Statistics, vol. 52, pp. 356-362.

Breusch, T.S. and Pagan, A.R. (1980) "The Lagrange Multiplier Test and its Applications to Model Specification in Econometrics" Review of Economic Studies vol. 47, pp. 239-253.

Chapman, M. and Prothero, R.M (1983) "Themes on Circulation in the Third World." International Migration Review, vol. 17, pp. 597-632.

Cordey-Hayes, M.(1975) "Migration and the Dynamics of Multiregional Population Flows." Environment and Planning A. vol. 7, pp. 793-814.

Da Vanzo, J. (1978) "Does Employment Affect Migration? Evidence from Micro Data." Review of Economics and Statistics, vol. 60, pp. 504-14.

David (1974) "Fortune, Risk and the Microeconomics of Migration" in P. David, and M. Reder (eds.) Nations and Households in Economic Growth, Academic Press.

Domencich, T. and D. McFadden (1975) "Urban Travel Demand: A Behavioural Analysis." North Holland, Amsterdam.

Ermisch, J. (1995) "Demographic Developments and European Labour Markets." Scottish Economic Society. 1995. pp. 221-235.

Evers, G. and Van Der Veen, A. (1985) "A Simultaneous Non-Linear Model for Labour Migration and Commuting" Regional Studies, vol. 19, pp. 217- 230.

Fields, G. (1976) "Labor Force Migration, Unemployment and Job Turnover." Review of Economics Statistics, vol. 58, pp. 407-415.

Gordon Hughes and Barry McCormick (1994) "Did Migration in the 1980's Narrow the North-South Divide?" Economica. vol. 61, pp. 509-27.

Gordon, I (1985) "The Cyclical Interaction Between Regional Migration, Employment and Unemployment: A time Series Analysis for Scotland." Scottish Journal of Political Economy, vol. 32, no. 2, pp. 135-158.

Green, A. E. "A Question of Compromise? Case Study Evidence on theLocation and Mobility Strategies of Dual Career Households." Regional Studies, vol. 31, no.7, pp. 641-658.

Greenwood, M.J., Hunt, G., Rickman, D.S. and G.I. Treyz (1991) "Migration, Regional Equilibrium, and the Estimation of Compensating Differentials." American Economic Review, vol.81, pp. 1382-90.

Greenwood, M.J. (1969) "An Analysis of the Determinants of Geographic Labor Mobility in the United States." The Review of Economics and Statistics, vol. 51,pp.l89-194.

Greenwood, M.J. (1985) "Human Migration: Theory, Models, and Empirical Studies." Journal of Regional Science, vol. 25, pp. 521-44.

Harrigan, F.J, McGregor, P.G and Perman, R.J (1990) "Alternative Perspectives on Unemployment and Migration: Theory and Scottish Evidence." Strathclyde Papers in Economics.

Harrigan, F.J, McGregor, P.G, Dourmashkin, N., Perman, R.J, Swales, K. And Yin, Y.P. (1991) "AMOS: A Macro-Micro Model of Scotland." Economic Modelling, pp. 424-479.

Harris, J.R. and M. Todaro (1970) "Migration, Unemployment and Development: A Two-Sector Analysis." American Economic Review, Vol. 60, No.1, pp. 125-42.

Hart, R.A. (1973) "Economic Expectations and the Decision to Migrate: An Analysis by Socio-Economic Group." Regional Studies, vol. 7, pp. 271-285.

Hart, R.A. (1975) "Interregional Economic Migration: Some Theoretical Considerations (Part II)" Journal of Regional Science, vol. 15, no.3, pp. 289- 305.

Layard, R., Nickell, S. and Jackman, R. (1991) "Unemployment: Macroeconomic performance and the Labour Market." Chaper 6, Oxford.

Mangalam, J. P. (1968) "Human Migration." Lexington.

Molho, I. (1986) "Theories of Migration: A Review." Scottish Journal of Political Economy, pp. 396-417.

Molho, I. (1995) "Migrant Inertia, Accessibility and Local Unemployment." Economica, vol. 62, pp. 123-132.

Richard Jackman and Sawas Savouri (1992) "Regional Migration in Britain: An Analysis of Gross Flows Using NHS Central Register Data." Economic Journal. November, pp. 1433-50.

Rossi, P. (1980) "Why Families Move, California." Sage Publications, London.

Sjaastad, Larry. A. (1962) "The Costs and Returns of Human Migration." Journal of Political Economy. Supplement, October.

4 Multimedia Super Corridor (MSC): Malaysia's Move Towards The Knowledge Economy

Maniam Kaliannor
Faculty of Administration and Law,
Universiti Teknologi MARA.

Abstract

World economy has gone through many changes since bartering first started. Now another new economy has emerged, the knowledge based economy (K-economy), which focuses on knowledge as an important input of the economy besides capital and labour. Malaysia entered into the information age in 1991 when we launched our Vision 2020 in which we set a goal to become fully developed nation by the year 2020. In 1996, the government created MSC with the purpose to create an integrated environment with all the unique elements and attributes necessary to provide the perfect global multimedia climate. The MSC aimed catalysing a highly competitive cluster of Malaysian ICT companies nurtured to become world-class over time. This paper addresses MSC strategy, characteristics of K-economy, the achievements in terms of creation of K-workers, Private Direct Foreign Investment (PDFI)/capital inflow and finally the future prospects and challenges that Malaysia will face in transforming the nation into knowledge based economy.

INTRODUCTION

Malaysia is a country that is undergoing a fundamental transformation as the agriculture and industrial society of the past is rapidly evolving into the information society of the 21st century. The mastermind of this evolution, the Prime Minister, Dato Seri Dr. Mahathir Mohamad as the head of the Malaysian government, created the framework of future vision that is Vision 2020, which holds the promise of improving the lives of citizens, creation of knowledge society, bridge the communication gap internationally and transform the country into a fully developed country which will stand strongly on the platform of digital and information technology.

According to Dr. Mahathir Mohamad, only when both manufacturing and service sectors are manned by knowledge workers and powered by Information Technology (IT) can the country sustain the required per capita GDP growth rates to attain Vision 2020. We need not to be a computer scientist in order to become a knowledge worker. Anyone can be a knowledge worker including the person who sells food by the roadside or a taxi driver; so long he or she uses knowledge or information technology to do his or her job better. (Sunday Tribune, 12 Oct 98).

MULTIMEDIA SUPER CORRIDOR (MSC)

Multimedia Super Corridor is Malaysia's comprehensive and ambitious blueprint to catalyst Vision 2020 by providing the intellectual and strategic leadership. Dr. Mahathir said:

> "I see the MSC in 2020 as a multicultural 'web' of mutually dependent international and Malaysian companies collaborating to deliver new products and services to customers across an economically vibrant Asia and the world."
>
> (Dr. Mahathir, 1 Aug 1996).

The establishment of MSC could not have come at a better time and for a better reason. The Prime Minister, Dato Dr Mahathir Mohamad said, ..."Malaysia is crossing the threshold into the Information Age with hope and confidence. We are embracing the borderless world, and opening ourselves up to new forms of partnership and commerce made possible by revolutionary changes in computing, communication, capital flows and consumer tastes. While some see these changes as a threat, Malaysia see them as an unprecedented opportunity to 'leapfrog' our development and achieve our Vision 2020 goals..."

The investment into this master plan is an initiative mainly to attract the world-class leading edge companies in information technology and communication (ICT) to move its information technology based development activities across borders to be in the most cost-effective platform backed by the Malaysian Government's commitment and guarantees. Multimedia Development Corporation (MDC) is an engine established to run and monitor the successfulness of the MSC by being a one stop shop or center for all activities related to the development and implementation of the MSC. MDC has an exclusive board of advisory. Bill Gates, the founder and owner of Microsoft, the world's largest computer software manufacturing company, has agreed to be a member of the advisory board of the Multimedia Development Corporation, which is developing the Multimedia Super Corridor. (Source : NST, 20.10.96).

Despite the recent economy and currency crisis, projects for MSC will proceed as planned. In fact, according to Dr. Mahathir Mohamad, the infrastructure development of the MSC was progressing ahead of schedule and was in fact expected to be ready about a year early – in December. (NST. 20 Jan 1998). Many

companies operating in other countries were keen to relocate to the MSC. This shows that MSC infrastructure is satisfactory. Mr. Masashi Kojima, chief executive counsellor of Nippon Telegraph & Telephone Corporation (NTT), said Japan is not only amazed by Malaysia's MSC project but also for the fact that it will apply the most latest technology in It. (Source: Shipping Times, 2 August, 1996).

MDC envisions a 20-year time frame for the full implementation of the MSC, when Malaysia will achieve leadership in the Information Age. There will be three phases of activity:

Phase I — MDC will successfully create MSC, attract companies, launch seven flagship application, put in place a world leading framework i.e. Cyberjaya and Putrajaya as world fist intelligent cities.

Phase II — MDC will link the MSC to other cyber cities in Malaysia to create a web of corridors and establish a second cluster of world-class companies.

Phase III — It is expected that Malaysia will be transformed into a knowledge based global test bed for new multimedia and IT applications and a cradle for a record number of multimedia will have cluster of intelligent cities linked to the global information superhighway, and become International Cyber court of Justice.

MSC FLAGSHIP APPLICATIONS: A WORLD OF OPPORTUNITY

MSC is Malaysia's gift to the world. The flagship applications contain an unprecedented and attractive opportunity for local and international business; in their variety and scope, and in the manner in which they are being offered to the global community. Prime Minister Datuk Seri Dr Mahathir Mohamad announced MSC Flagship Applications on August 1 when he delivered the keynote address at the opening of the Multimedia Asia '96 conference and exhibition. MSC has begun with seven (7) flagship application. These seven applications are:

1. Smart Schools
2. Multi Purpose Card (MPC)
3. Electronic Government
4. Tele-Health
5. R&D Cluster
6. Borderless Marketing Center
7. Worldwide Manufacturing web

The latest launch of the flagship was the MSC flagship Centre and Centre for Health Innovation and Medical Enterprises on the 7 September 2002 by the Prime Minister in Cyberjaya.

Through the flagship applications, the government extends an open invitation

to the multimedia community in Malaysia and throughout the world to participate in the MSC. Companies that take up the offer will be able to create value for themselves and their scholarships in an environment uniquely suited to their needs and at the same time have the opportunity to help transform Malaysia and the region. The seven flagship applications can be categorized into two categories as:

1. Multimedia Development Applications — offering concrete business opportunities to facilitate the MSC's development.
2. Multimedia Environment Applications — providing an optimal environment that supports multimedia companies entering the MSC.

Multimedia development applications are the ones for which companies can bid for projects, and develop tangible applications. The multimedia development applications consist of Smart Schools, GMPC, Electronic Government and Telehealth. Whereas, the second category which is multimedia environment applications are R&D Cluster, Borderless Marketing Center and Worldwide Manufacturing Web. This applications emphasize on establishing the right environment for R&D and Electronic Business to take place such as setting up laws and policies that safeguard the security of information transacted electronically, ensure interoperability and standardization of core technology platform, etc. R&D Cluster aims to establish networking between R&D Clusters in the MSC, and encourage closer collaboration between industry and academic through joint R&D projects worldwide. World Wide Manufacturing Web is a flagship application to enable manufacturing and manufacturing related companies to develop high value added products or services for their clients globally for an example through implementation of Enterprise Resource Planning systems (ERP), remote monitoring etc. Borderless Marketing Center is basically related to electronic commerce and development. Worldwide Manufacturing Web and Borderless Marketing Center been merged as E-Business. E-Business basically involves business activities conducted online.

OBJECTIVES OF FLAGSHIP APPLICATION

The flagship applications are a necessity to drive the successful implementation of the MSC towards becoming knowledge society. There are three main objectives of the flagship applications. They are:

1. To jump start and increase the momentum of the MSC
   The flagship application will play a vital role in jump starting and increasing the momentum of the MSC throughout the three phases of implementation beginning from year 1996 till year 2020. The ultimate resort to enable this is by attracting local or foreign companies to participate and develop leading-edge products or services in the MSC and meet the requirement of the flagship applications. As at year 2000 there are a total of 429 approved MSC status companies out of which 38 are world-class companies. The MDC's statistic also shows that there are 274 Malaysian owned companies and 144

foreign owned companies. These numbers have remarkably changed over the period of 1 year from year 2000 to current year 2001. At the present stage, there are a total of 615 companies that have been granted with MSC status. Among them 592 are MSC Status companies and 23 are Higher Education MSC Status. The MSC approved status world-class companies have touched 50. (Source: MDC Website).

2. To make the MSC a global test bed for innovative solutions
   MSC in this context aims to be a global test bed for innovative solutions by encouraging web shapers and service providers to use the MSC as their research and development centers for cutting edge products or services. This will open opportunities for local recipients to embark into these applications and enable transition from a caterpillar (industrial age) to a butterfly (information age). It is also believed that MSC will be a test bed for finding innovative solution, which will be implemented globally to enhance the quality of services.
3. To increase Malaysian Productivity and Competitiveness
   MSC will serve as a catalyst for the formation of an electronic government. It is the aim of government to enhance its productivity, as well as communications with citizens and companies through a wider adoption of Information and Computer Technology (ICT). Towards the end, the flagships of which many are world's first, are envisioned to attract foreign leading-edge technology developers. The creation of a conducive environment and infrastructure as part of the MSC will also contribute towards increasing productivity and competitiveness. Development of local multimedia industries is essential in order to achieve the status of developed knowledge-based economy and country by year 2020. Localization of technology will also save costs thus increase the revenue. The flagship applications will also help to develop the local multimedia industries through ToT (Transfer of Technology) programmes from Multi National Companies (MNC).

WHAT IS KNOWLEDGE ECONOMY?

The role of information technology (IT) and knowledge management is ever increasing in modern economy. Economic and social structures of almost every country are rapidly changing due to reasons such as:

1. Growth in IT utilization amongst both developing and developed nations like Singapore, Malaysia, India, Hong Kong, Japan and China in both public and private sectors.
2. Accelerated growth in terms of computer and Internet penetration, example in Asia alone 64 million people are expected to use the Internet by the 2003 (Goldman Sachs Investment Research, 1999).
3. Convergence between information and communication technologies (ICT).

The knowledge based economy (K-economy) is about how the new technolo-

gies have transformed the way we think and act, and the ways in which we use the Internet and ICT's to improve the world economies. Bank Negara Malaysia (2000), describe K-economy in three aspects:

1. K-economy focuses on knowledge as the driver of economic growth, as knowledge can increase the production and transform them into new products and processes.
2. K-economy encompasses both qualitative and quantitative changes that transform the structure, mode and the way the economy operates. To compete in the K-economy environment, one needs to focus on the exploitation of intellectual capital, information advantage, E-learning, culture and agile organization.
3. Firms in K-economy focus on investment intangibles such as human capital, R & D capacity, customer's database, brand names and reputation. As creators of knowledge-based asset, K-firms create and organize intellectual assets, exploit networks and gain access to other clusters of knowledge assets that belongs to their suppliers and customers.

The factors outlined above have collectively led to the advent of the K-Economy, also commonly referred to as Internet Economy (I-Economy) or Electronic Economy (E-Economy). K-Economy has several attributes or characteristics (ETECH 2000):

1. E-Commerce is the key force driving K-Economy.
2. Emergence of new business models i.e. termed Electronic Business (E-Business) in both developed and developing nations.
3. Economic focus is seen to be changing i.e. from one that is input/production centric (Production Economy) to one that driven by output with emphasis on higher productivity.
4. The role of information technology in formulation of business strategy and economic policies is extremely important to ensure that a nation is able to sustain its competitive edge.
5. Regional and global cooperation between nations particularly within the area of ICT sector is increasing which slowly diminishes the traditional geographical boundaries between nations.
6. The role of Knowledge Workers (K-Workers) and intellectual capital is vital for sustenance of national competitive advantage.
7. Change is the only constant because it occurs without and prior signal. Good examples would be the case of Amazon.com and Mp3.com that offered new business models that look both the publication and music industry by storm.

Both businesses and government have realized that the advent of the electronic era has created opportunities along with threats (if businesses/ government do no react) within particular economy. There are two major forces described as spearheading the new economy (MDC, 2000). The first major force driving K-econ-

omy is creativity and innovative capability. An example of creativity and innovation is utilization of the Internet fro business e.g. Amazon.com uses the Internet to sell books. Governments establishing interactive broad and infrastructure that allows society in general to very quickly download information and communicate using technologies such as teleconferencing, videoconferencing and other Internet and wireless based application. For example, Singapore provides 150 public services from one portal (Holmes, D., 2002). Changes within economies as a result of creative and innovative technology are continuously reducing operations cost for government and businesses alike. A survey by OECD (2000) suggests that Internet banking has reduced transaction costs from US$1.08 per transaction to US$0.13 per transaction.

Secondly, globalisation is another vital element in the context of a new economy. Globalisation from an economy perspective is not something new. Over the last five centuries companies in more economically advanced nations have extended their presence across the globe through trade and other activities related to production. Nevertheless, over the past two or three decades, the globalisation process has increased significantly due to factors such as policy liberalization in the area of trade, finance and investment coupled with technology enhancements (Khor, Martin, 2000). With the impending WTO treaty and AFTA staring at the Malaysian economy gateway, we can expect unrestricted global capital and trade movements. While there are negative implications of globalisation particularly for the less developed nations, the process has significant potential to spur global E-business.

The combination of these two factors could result into destruction of traditional barriers of time and space. For a business particular the potential outcomes of the combination of these two major forces driving K-economy are:

1. Shorter business transaction and communication time (through creative and innovation, e.g. internet and wireless applications).
2. Reduced traditional economic boundary between economies (through globalisation)

K-ECONOMY AND MALAYSIA

To sustain its competitive advantage, Malaysia should adopt every measure possible to spur productivity. In this regard, Knowledge Management from Malaysia's perspective is its best bet for the next wave of economic growth. WHY? The significant growth in per capita income with relatively stable inflationary conditions has lead to real wages increasing at a faster rate than labour productivity. As labour becomes more costly, Malaysia could inevitably lose some of her FDI to other nations such as Myanmar, Thailand, Vietnam or China, where labour cost is currently, relatively less costly. Given the above scenario, Malaysia could be described as being faced with the following challenges:

1. Ensuring that FDI continues to grow.
2. Ensuring that both capital and knowledge is transferred to the extent that Malaysia, could by herself, continue to nurture economic growth.
3. Ensuring that productivity within existing economic activity increases i.e. GDP per unit of labour would be higher. Information and communication technologies in this regard are vital for Malaysia's pursuit to higher productivity.

The Prime Minister of Malaysia, Dato' Seri Dr. Mahathir Mohamad in his speech on 8 March 2000 said that:

> "...It is necessary to ensure a paradigm shift from production driven economy (P-economy) to the knowledge economy (K-economy). However, the basic structure of the Malaysian economy will not be fundamentally altered in the short or medium term. The important factor is the maximum application of knowledge to every Malaysian economic and business endeavour in every economic sector..."

In order to achieve smooth transition of K-economy in Malaysia, some strategies should be given due focus (Mohamad Jawarhal, 2001):

1. Cultivating and securing the necessary human resources, emphasising on education, training and retraining, and life long learning, in particular computer literacy.
2. Establishing the institutions to drive the K-based economy.
3. Providing necessary incentives for info structure and infrastructure.
4. Building science and technology capacity.
5. Ensuring that private sector leads the K-economy.
6. Transformation of the public sector into K-civil service.
7. Bridging the knowledge and digital gap/divide.
8. Fostering of trisectoral collaboration among the public sector, private sector and civil society organizations to direct, coordinate and supervise the transformation process vigorously to increase the capacity of science and technology, ICT acquisition and application

ICT has a strategic role in accelerating the economic growth process by increasing the efficiency and productivity of all sectors in the economy. In this regards, the government through the Eight Malaysian Plan (RM8, 2000 – 2005), have plan more concerted efforts to position Malaysia as a competitive knowledge based economy, with ICT facilitating the development. Under the Eight Malaysian Plan (2000 – 2005), a total of RM 5.2 billion will be allocated for ICT related programmes and projects. Therefore, ICT infrastructure will be expanded, particularly to rural areas to bridge the digital divide and enable all citizens to have equitable access to knowledge and information. Moreover, as the knowledge based economy requires new skills, competencies and broadband connections for advanced multimedia applications, emphasis will be given to human resource development and network infrastructure to enable Malaysians to benefit fully from rapid tech-

nological developments. Besides that emphasis will also be given towards hard and software infrastructure as well as the building of a critical mass of SMEs and Internet users to enable Malaysia to move rapidly towards becoming a developed nation with knowledge based society. The strategic thrusts for the development of ICT will include (Eight Malaysian Plan, 2000 – 2005):

1. Positioning Malaysia as major global ICT and multimedia hub.
2. Upgrading and expanding the communication infrastructure to increase accessibility throughout the country as means of bridging the digital divide.
3. Enhancing human resource development in ICT to increase the supply of highly skilled and knowledge manpower.
4. Promoting E-commerce and enhancing its use to enable Malaysia to compete more effectively in the global market.
5. Fostering local capabilities in creative content development.
6. Rolling out the MSC flagship applications to further provide the momentum for the development of MSC.
7. Nurturing a critical mass of ICT based SME's.
8. Promoting R&D activities on soft factors of ICT and information age developments that affect individuals, organizations and societies.

NATIONAL IT AGENDA

This was launched in 1996 with the purpose of transforming the nation into a knowledge based society in line with Vision 2020, focused on human development and leveraging on the public-private sectors partnership. The framework was based on the balanced development of three key elements i.e. people, info structure and applications. The National IT Council (NITC) launched the Strategic Thrusts Agenda with the primary objective of effectively facilitating the migration of Malaysians and institutions into the emerging networked global environment. Five strategic thrust areas were identified:

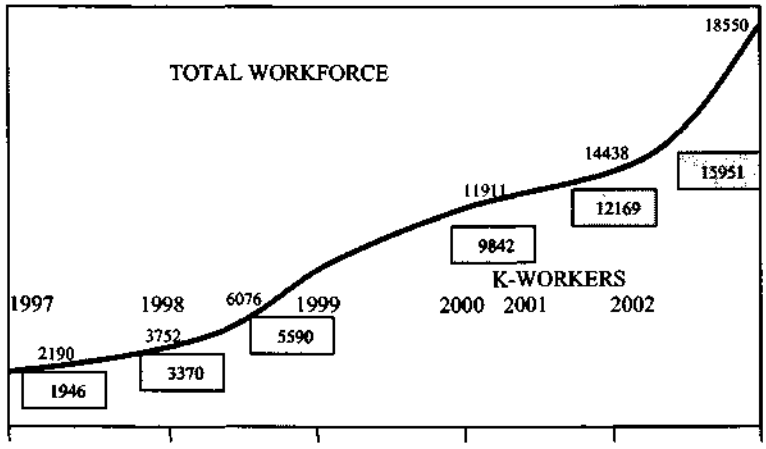
1. E-Economy
2. E-Public Services
3. E-Community
4. E-Learning
5. E-Sovereignty

In order to ensure the implementation of the above stated strategic thrust, the NITC established the Strategic Implementation Committee (STIC) to operationalize the Strategic Thrusts Agenda. Some of the projects that have been implemented thus far are E-Community Resource Exchange, National Grid of Learning, ICT Community Chest and Subang Jaya 2005 (SJ 2005).

ACHIEVEMENTS

1. Knowledge Workers

Companies accorded MSC status have successfully generated more than 18, 000 jobs this year (2002), of which 15, 951 are knowledge workers (NST, 6 September 2002). Figure 1 indicates the increase in the number of knowledge workers since 1997 till 2002. In terms of percentage growth, it has recorded about 721 % growth in terms of increase in total workforce and about 720 % growth in terms of increase in total knowledge workers. It indicates that the MSC plan and activities are giving good investment returns to the country.



Source: MDC, 2002 and NST

Figure 1: Job Opportunities Created by MSC

2. MSC status companies

Up to date, a total of 745 companies have been accorded MSc status, out of which 495 are local firms and 53 of world-class standard companies and organizations (NST, 6 September 2002). Table 1 indicates the increase in the number of companies with MSC status (both local and foreign companies) from the year 1997 – September 2002.

Table 1: Companies with MSC status

Indicator	1997	1998	1999	2000	Current
Total MSC Status Companies	94	195	300	429	745
World Class Companies	13	31	34	38	53
Local Companies	46	101	176	274	495

Source: MDC, 2002 and NST

3. Sales
   A survey conducted by MDC, showed that 407 MSC-status companies have recorded a total sales of RM 5.65 billion, of which RM 4.25 billion registered locally (NST, 6 September 2002). This is surely a booster for the development of local economic growth.
4. Expenditure
   Total expenditure stood at RM 4.77 billion, out of which RM 3.65 billion in operational expenses and RM 1.21 billion in capital expenditure (NST, 6 September 2002). This indicates the capital inflow into the country, which will improve the Balance of Payments (BOP) account.
5. Knowledge Economy Master Plan
   The government launched the action plan for knowledge economy on 9 September 2002; aims to catalyse new growth to further propel the nation into K-economy. Institute of Strategic and International Studies (ISIS) Malaysia, was entrusted to develop the master plan under the guidance of a steering committee headed by the Ministry of Finance.

The master plan identified at least seven reasons why Malaysia should develop a K-economy (The Star, 10 September 2002):

i. According to the World Competitiveness Report, Malaysia's international competitiveness has slipped from 18th place in 194 to 29th place in 2001. The trend has been arrested.
ii. Malaysia is facing increasing competition for its products from countries like China, India, Vietnam and Indonesia, which enjoy cheaper labour and more abundant resources.
iii. With globalisation and liberalisation, Malaysia will have to prospect for new products and services which are viable in the emerging global market.
iv. As costs, especially labour cost, climb, Malaysia will have to ensure even higher value is added to its products for its industries to remain viable.
v. In the enduring search for higher profit and greater wealth, Malaysian companies have little choice but to move the pre-production stage and post-production stage of manufacturing, because there is less profit from the core production process. The pre and postproduction stages also happen to be more knowledge intensive.
vi. New sources of growth are required as old sources of growth become less productive. A K-based economy will provide some of these sources of growth.
vii. The migration to the K-economy would greatly enhance Malaysia's ability to meet its total factor productivity (TFP) enhancement goals. TFP is vital as it reflects the increasing importance of knowledge, human capital, innovation and investments in information and communication technology in the K-economy.

6. Budget 2003
   The federal government proposed that companies granted "Strategic K-based Status" be given Pioneer Status or Investment Tax Allowance under the existing high technology industry package. Moreover, expenses incurred by these companies in preparing their "Knowledge-based Master plans" would be tax-deductible (The Star, 26 September 2002). The purpose of this incentive is to encourage companies to move towards Knowledge-based activities.
7. Penang i-land K-economy
   Penang has become the first state to unveil the Knowledge-Information Communications technology (K-ICT) blueprint to transform the state into an intelligent land by 2010 (The Star, 19 September, 2002). A five strategy initiatives has been drawn up which includes connectivity, K-worker, development, E-economy, digital equity and electronic good governance.

THE MALAYSIAN CHALLENGE

To fully maximize productivity enhancements and obtain maximum benefit from opportunities given the advent of the knowledge economy, Malaysia needs to overcome several challenges:

1. Increasing internet and PC penetration amongst Malaysians.
2. Creating significant level of awareness amongst Malaysians from all walks of life on issues such as knowledge economy i.e. its importance, our role as knowledge workers and new opportunities that exist in the new economic era.
3. Ensuring that Malaysians fully trust the internet for all online payment purposes.
4. Attracting leading foreign based information and technology companies to invest and share expertise in Malaysia.
5. Transforming the mind set of business leaders i.e. from being internally focussed to leaders that have vision and accurate understanding of changes taking place on a global basis.
6. Re-examining the education system and research work conducted to enhance knowledge creation.
7. Enhancing policy and regulatory framework making it more practical and feasible to the demands of a changing economy.

To further enhance Malaysia's ability to compete on a global basis, the relevant policy makers can adopt several key measures. Firstly, pre-requisites for successful development of E-business and E-commerce applications must be in place. Efforts such as creation of knowledge based society should be given priority in every five-year economic master plan. Secondly, SME's in Malaysia should be encouraged and lead to joint ventures and collaborative partnerships with global players involved in similar activities. In this context, efforts within the MSC e.g. venture capital, funding, grant schemes and establishment of Incubator centres should

REFERENCES

_____The Star (10 September 2002), Malaysia making progress in becoming knowledge – based economy.
_____The Star (19 September 2002), Penang Unveils K-ICT Blueprint, pg: 16
_____The Star (26 September 2002), K-economy Masterplan: Strategic status brings changes, jitters (page: 3, Tech.Plus)
_____New Straits Times (6 September 2002), MSC-status firms created 18 000 jobs, page: 3.
Mahathir, Mohamad (2000), The Malaysian Crisis: How and Why it Happened, Kuala Lumpur, Economic Planning Unit.
Peter M. Senge (1990), The Fifth Discipline, Bantam Doubleday Dell Pub. Group.
_____Eight Malaysian Plan (2000 – 2005), Percetakan Nasional Malaysia Berhad.
_____The Third Outline Perspective Plan (2001 – 2010), Percetakan Nasional Malaysia Berhad.
_____The Star (28 August 2001), K-Economy: This word can kill, page: 42.
_____Internet Asia (July 1999), Goldman Sachs Investment Research Report.
_____The Enterprise Development Website: The Knowledge Economy http://www.enterweb.org/know.htm.
_____The Star (11 December 2001), K-Economy: More Pressure needed from Government.
_____New Straits Times (20 October 2001), Malaysia: Moving towards K-based economy.
_____New Straits Times (28 January 2001), Malaysia's Transition into K-economy Slow.
_____Neela, M. (2001), HRM in K-economy and Managing Knowledge Workers, Malaysian Institute of Human Resource Management.
_____Maniam, K. (2002), Malaysia & K-ekonomi: Satu Analisis, paper presented at conference in Universiti Utara Malaysia.
_____Multimedia Development Corporation (MDC) website on the MSC, http://www.mdc.com.my.
_____Booz, Allen & Hamilton (1997), Revitalizing the Korean Economy Towards the 21st Century.

5 A Chronological Survey of Production Functions with Special Emphasis on Total Factor Productivity Measurement Using Productivity Index Method and Solow's Production Function Approach[1]

P.J. Atchiah
Faculty of Bussiness Management,
Universiti Teknologi MARA.

Abstract

This paper will attempt a broad chronological development of production functions and attempt a comparison of the two popular methods, namely Productivity Index Method (Divisia Index) and Solow's Production Approach, in the measurement of Total Factor productivity. The pros and cons will be highlighted in some detail. The concluding remark will bear upon the most appropriate approach or method to be used in the measurement of total factor productivity.

INTRODUCTION

The measurement of Total factor productivity (TFP) has evolved historically and has a basis in the modern production theory*. Almost all productivity measurements fall into two approaches. They are a) growth accounting approach and b) econometric approach to productivity measurement. According to Antle and Susan (1988), the growth accounting approach uses index number measures of TFP to quantify the components of productivity change; and, alternatively, econometric methods can be used to estimate the components of TFP using production, cost, and profit functions. Antle and Susan also observe that each approach requires certain assumptions, which must be considered in interpreting the finding s of productivity studies. At juncture one should note that not all measurements of productivity (either in manufacturing or service sectors) can capture changes in TFP and ultimately decompose it into components measuring " changes in technical efficiency, scale, and the state of technology" (Antle and Susan , 1988). Meaning, to

1 John M. Antle and Susan M. Carpalbo. An Introduction to recent developments in production theory and production measurement (Paper). Agricultural Productivity measurement and explanation, Washington D.C. Resources for the future, 1988.

capture residual effects on Productivity, sophisticated measurements are needed to capture and decompose TFP. Before we can attempt a comparative study on the two approaches, let us take a look at modem production economics in terms of functional structure and functional form.

AN HISTORICAL PERSPECTIVE ON PRODUCTIVITY MEASUREMENTS AND PRODUCTION FUNCTIONS

It will be interesting to see how modem production economics has evolved to high level of sophistication. The table below is an attempt to show an historical perspective on the evolution of productivity measurements and production functions. The first column shows the pioneers of production functions (mostly neoclassical); the second column will indicate the type of production function and the consequent improvement of the latter on the former production function; and the third column will show the attributes of the production where possible.

Table 1: Historical Perspective of Production Functions

Pioneers of The Production Function	Name and chronology of The production function	Attributes of The Production Function	Restrictions of The Production Function
1. Cobb - Douglas (1928)	Production Analysis" (Theoretical and Empirical); 1920-1950's	Elegant, simple and ease of application	Unitary elasticities of substitution; constant production elasticities; constant factor demand elasticities
2. Heady (1952); Heady, Johnson and Hardin(1956); Heady and Dillian (1952)	Quadratic Production Function; 1952-1962	Less restrictive	Overcomes some of the weaknesses of the 'Cobb-Douglas Production Function'
3. Halter, Carter and Hocking (1957)	Transcendental Production Function; 1957		
4. Arrow, Chenery, Minnas and Solow (1961)	CES Production Function (CES: Constant nonunitary Elasticity of Substitution; 1961)		
5. Uzawa (1962)	Multifactor CES; 1962		

6.	Zellner and Revanker (1969)	Generalized Production Functions (Cobb - Douglas Production Function Incorporated); 1969		
7.	Revankar (1971)	Variable Elasticity of Substitution Production Function; 1971		
8.	Hanoch (1971)	Constant Ratio Elasticity of Substitution - Homothetic; 1971		
9.	Christensen, Jorgenson, Lau and Diewart	Flexible Functional Forms and The Generalized Leontief		

The above tabulation of the evolved production functions is certainly not exhaustive. On close scrutiny, we find that the pioneering effort of Cobb and Douglas (1928) is still a prominent land mark for production functions, although its applications are restrictive to some extent. Antle and Susan observe that " the 1960's and early 1970's saw production theory move from the neoclassical approach, based on production function and differential calculus, to the modern approach, based on the analysis of technology sets using the mathematical theory of convex sets. The modern approach permitted the duality relations between the production technology and cost, revenue and profit functions to be derived rigorously and elegantly". In other words, the neoclassical models extending up to early 1970's have not been able to incorporate completely the effect of technological changes in their production functions and this has lead to more innovative mathematical approaches (accounting and econometric) to capture residual effects on productivity growth rates. Here, technological change refers to " the changes in a production process that come about from the application of scientific knowledge". In this case, changes in production processes can mean two things : One, disembodied technological change (i.e. through improved methods of utilizing existing resources such that a higher output rate per unit is obtained). This change can be modeled in terms of a shift in the production surface. Two, embodied technological change (through the introduction of new processes and new inputs). Here, change can be modeled, not in terms of a shift in the production surface, but productivity movement along the production surface.

With the above review on production functions and technological change on total factor productivity, let us now embark on the measurement of the TFP using

productivity Index approach and Solow's production function approach.

TFP MEASUREMENT: PRODUCTIVITY INDEX METHOD (DIVISIA INDEX) AND SOLOW'S PRODUCTION FUNCTION APPROACH

Both approaches capture technological change in the production processes. Let us categorize and tabulate the TPF measurements for both the approaches[2]

Table 2: Productivity Index Method: TFP Measurement

Eq	Variables used	Formulae	Purpose
1.	Y = quantity of i^{th} output; X = quantity of the j^{th} input; = price of the $i^{th\ output}$ W_j = price of the j^{th} input	$P_1Y_1 + P_2Y_2 + \ldots\ldots + P_nY_n = W_1X_1 + W_2X_2 + \ldots\ldots W_mX_m +$	Social accounting identity
2.	Q = TFP = Y/X, N, = relative shares of the value of the i output in the value of total output; M_j = relative share of the value of j_{th} input in the value of total input	$Q/q = Y/y - X/x = \Sigma N, Y/Y, -\Sigma M, Xj/Xj$ $Q/q = P/p - W/w = \Sigma N, Pj/P; - \Sigma Wj/Wj$	Divisisa quantity indexes Divisia Price indexes
3.	K = indictes shift in the production function	$K = \Sigma N, Y/Y_1 - \Sigma M_1 X, / X, = Y/Y - X/X = Q/Q =$ TFP	Showing relationship between TFP and the shifts in production function
4.		$K = P/p - W/w$	Interpreted as movement along the production function
5.	$\triangle$ = change ln = natural log	$\triangle \ln Q - \triangle \ln Y - \triangle \ln X$ (subject to interpretation)	Conventional index of TFP
6.	f/f = shows proportional shift in the production function with time (technical change); ε_{cy} = cost elasticity;	$Y/y = \Sigma\varepsilon^{-1}_{cy}\ W_j/C.X,/X, +$ f/f	An expression for the proportionate growth of output in the measurement of TFP.
7.		$X/x = \Sigma Mj.\ X, / X, = \Sigma\ Wj\ Xj / C\ .Xj/Xj$	Proportionate rate of growth of input in the measurement of TFP.

2 To fulfill this purpose, two articles are extensively referred : a) Naziruddin Abdullah, Measurement of total factor productivity for the Malaysian rice sector, IIUM Journel of Economics & Management 5, N0.2(1997):67 - 95, International Islamic University Malaysia Press; b) by the same author : A note on mathematical derivation of Total factor productivity.

8.	Substituting equation 7 in equation in equation 6.	$Y/y = X/x\ \varepsilon_{cy} + f/f$ $f/f = Y/y - X/x.\ \varepsilon^{-1}_{cy}$	Sugggests that technical change is the index of output minus the proportionate rate of growth of elasticity w.r.t output multiplied by the index of aggregate inputs.
9.	Final Equation	$TFP = f/f + (\varepsilon_{cy} - 1).\ X/x$	This is a very important equation that decomposes TFP.

Equation 9 is the actual application and decomposition of TFP. From this equation we will see that $\{ (\varepsilon^{-1} cy^{-}) = 1 / \varepsilon_{cy} \}$ is actually scale elasticity reflection the change in cost with respect to output. If production is experiencing constant returns to scale, meaning ε_{cy} is equal to 1, then logically the function collapses into ff f = TFP. That is, technical change is equated to total factor productivity.

Let us now look at Solow's Production function approach in the measurement of total factor productivity.[3] Before we can attempt a similar tabulated analysis of the function, let us explore this approach. Nobel Laureate Robert Solow (1957, 1965) found that a significant proportion of a nation's economic growth (more so for DCs than LDCs) was attributable to "technical change", or " total factor productivity growth", which he proposed as "residual", based on a so-called " production Function". There have been many cases of extensive application of this method in R&D application or line-of-business level data. Various citations abound with regard to it application in the industry. Namely, investment in R&D for firm and consequent residual effects (Mansfield, 1965;Clark and Griliches, 1984); Link, 198 la, 1981 b; Griliches, 1986) and industry aggregates (Terleckyi, 1974; Griliches, 1979, 1994; Griliches and Lichtenberg, 1984a, 1984b; Scher,
1982, 1884).

Sholomo Maitaf paper uses Solow's approach and the concept of total factor productivity as a microeconomic tool for " analyzing and partioning labour productivity change in individual firms." Maitaf observes that Solow's Production Function Model is insightful because it shows whether companies' labour productivity gains are driven principally by "capital investment", or whether they are driven by "technology and knowledge". Let us now look at Robert Solow's production function model and how he decomposes the function to capture the residuals.

3 In my study of Solow's production approach in the measurement of TFP, Professor Shiomo Maitaf's article 'Total factor productivity as a performance benchmark for firm : Theory and evidence", Technion-Isreal Institute of Technology and MIT Sloan School of Management, has been referred and cited extensively. (smaital @ mit,edu).

Table 3: Solow's Production Function Approach: TPF Measurement

Eq	Variables used	Formula	Purpose
1.	TPF = Total Factor Productivity	TFP = VA/ [L^{α} / K1-$^{\alpha}$]	
2.	VA = Value Added ($): Sales revenue minus cost of materials. K = capital (generally, shareholder's equity) a = fraction of the value added attributable to labor. VMPL = Value of the Marginal Product of Labor.	α == [L. VMP_L] / VA	
3.	1 - α = fraction of 1 - α = [K. VMPJ] value attributable to capital. VMP_L = Value of the Marginal Product of Capital		

Let us examine Solow's model in more detail and try and derive TFP with respect to time.

The Model:
From the above table, we know that:

(1) TFP = VA/ [L^{α} / K1-$^{\alpha}$]
Next divide RHS and LHS of equation (1) with L

We obtain:

(2) TFP = [VA/ L] / [(K / L) $^{1-\alpha}$]
(Please refer to my appendix for derivation)

Next, take logarithms of both sides

(3) log TFP = log [VA/L] - (1-α) log [K/L]

Derivate (3) with respect to time (d/dt).
We will obtain the final disembodied production function capturing TFP.

That is:

(4) d log TFP / dt = d log [VA / L] / dt - (1 - a) d log [K / L] / dt

Equation (4)[4] is very important and this equation shows whatever part of the change in labour productivity in NOT attributable to capital deepening (higher capital employee), must be caused by non-capital factors like better management, knowledge, motivation, etc. (Solow (1957) paper). In other words, the change in total factor productivity, when computed for individual firms, can reveal the underlying factors that drive labor productivity.

COMPARATIVE ANALYSIS: PRODUCTIVITY INDEX APPROACH (PIA) AND SOLOW'S PRODUCTION FUNCTION METHOD (SPFM) IN CAPTURING TFP

TPF and Productivity Index Approach (PIA): Let us examine the strengths and weaknesses of this method in measurement of TFP. We carry out this appraisal in a bulleted format:

Strengths:

1. This method is comprehensive in the measurement of TFP. Unlike Cobb-Douglas production functions, the use of inputs in PIA is not restricted.
2. PIA use social accounting approach where there symmetry and balance when output values (P.Y) are equated with input values (W,X).
3. Using index number procedure, PIA successfully incorporates dynamic elements in the model in terms output and input growth rates. Meaning to say, it incorporates time element (t) in the measurement of TFP. More Specifically, PIA subjects divisia index numbers to natural logarithms and finally differentiates them with respect to time(t).
4. PIA, using simple mathematical treatment, also captures TPF or residual effects in the production functions. For example, given constant returns to scale and MPk. = MPL = MRTKL.=: PK/ PL, a movement along the production function (an isoquant or Total product curve depending on single or two variable input factors) can signify or indicate the change in TFP. Whereas, a mathematical shift in the production function can be due to real input factors other than TFP. PIA executes this with elegence.
5. The other superior quality of PIA is that it can link the family of divisia indexes wih parametric procedures (for example Hick's-neutral technical change). This is done to cross-check the consistency of TFP between the two procedures.[5]
6. Also, PIA using Divisia index numbers is flexible where it can be used to approximate production structures with arbitrary substitution possibilities (Naziruddin, 1997). This is not possible with Laspayers index where it assumes that all factors are perfect substitutes in the production process.
7. PIA has found extensive empirical applications in the measurement of TFP in

4 Verbally the final equation can be stated as follows: % change in TFP = % change in value added per employee - (l-a) (% change in capital per employee).

5 Naziruddin Abdullah, Measurement of total Factor Productivity for the Malaysian rice sector, IIUM Journal of Economics and Management 5. no.2 (1997): 67-95.

industry and agricultural sectors. Computer Softwares devised to run PIA and measure TFP has made the task of production economists much easier.

Let us now turn to the weaknesses of PIA. To my understanding , the following weaknesses (with regard to its methodology) can be stated.

1. Since PIA involves massive usage of divisia index numbers and link to other parametric procedures for the validation of TFP, the equations are rather complex for estimation. Granting certain limitations, Cobb-Douglas production functions and Solow's production functions are simple and elegant in execution and application.[6]
2. The second problem is not easy to obtain all the data sets to measure TFP using PIA approach. Industries may not be willing to provide independent researchers with genuine figures on industry output levels, prevailing price levels of outputs, inputs levels (i.e. K & L) .prices of input levels and quantity and price of intermediate goods used in the industry. Especially given intense rivalry among firms, providing these information to researchers, without proper safeguards, can prove detrimental to profit maximizing business entities. Confidentiality of industrial information, with respect to prices of inputs and outputs and quantities used in the production processes (unpublished), can be a strong limiting factor for the application of PIA in the measurement of'IT P. Of course, there are always exceptions to this case.
3. Inflation and quality of inputs used may not be captured by the PIA. In other words, since market distortions and transitional input qualities are difficult to be contained divisia index measurements, one cannot be sure the measurement and decomposition of TFP can reflect actual or spurious results. At this juncture, I am sure whether PIA a way to overcome this empirical problem.
4. If PIA's linkage with Hick's parametric procedures yields inconsistent results, which procedure should be adopted for the measurement of TFP? If the two procedures are not linked, the validation concerning the consistency of measuring the TFP growth becomes difficult.[7]

In my view, these are some of the limitations which can be overcome with further refinement of PIA in the measurement and decomposition of PTFP.

We will now embark on the strenths and weaknesses of Solow's Production Function Method (SPFM) in the measurement of TFP.

The Strengths of SPFM:

1. Unlike PIA, SPFM is simple and easy to execute. SPFM used in the measurement of TFP utilizes only three basic equations to derive TFP equation in the log format derivatd with respect to time (d / dt).

---

6 Please refer to footnote 1 , pg. 19 -21. _

7 For this linkage, the equation used is: P/ P = (1 - c^y) Y/Y + ^ ; Here the index number on the LHS (has to be defined further) is equated for consistency with parametric procedure on RHS.

2. Data sources are easy to obtain and one estimate TFP using Solow's without much difficulty. In this case total factor productivity can be estimated using publicly- available information contained mainly in balance sheets and pro-forma income statements (Shoimo Maital, 1999).
3. According to Shoimo argument, Solow's model can be equally useful for bench marking productivity change within individual firms.
4. It has been observed that SPFM can serve as a stimulus of further analytical questions that help both managers and investors better understand the firm's strengths and weaknesses.

The weaknesses of SPFM can be stated as follows:

1. SFPM is very restrictive in the sense that it is not as sophisticated enough as PIA to decompose TFP into residuals like scale effects and technical change. It only states that: whatever part of the change in labour productivity which is NOT attributable to capital deepening (higher capital per employee), must be caused by non–capital factors like management, knowledge, motivation etc.
2. It is my understanding that Unlike PIA, SPFM is not supported by any parametric procedures to cross-check the consistency of TFP measurement.
3. It is linear and assume constant returns to scale. This assumption does not arise in PTA.

CONCLUSION

This paper has attempted a brief historical development of production functions with special focus on two approaches in the measurement of total factor productivity. Both PIA and SPFM in the measurement of TFP are unique in their own respects and their application differ in terms of intensity and rigour. While SPFM may be suitable for fast track production managers in identifying residual effects on productivity and their consequent effect on profitability, cost and sustained competitiveness of firms, this method however, is not suitable for rigourous decomposition of TFP and production structures that are dynamic and with arbitrary substitution possibilities. This does not mean that the methodologies involved in understanding and disembodying productivity levels will have to be unnecessarily complicated. It is the author's contention that while not sacrificing analytical regour of productivity measurements, the production functions and the respective methodologies used to measure it has to be simple, elegant and easily executable using empirical data.

REFERENCES

Naziruddin Abdullah, A note on mathematical derivartion of total factor productivity (TFP) and its decomposition (unpublished, 1997), International Islamic University Malaysia Press.

Naziruddin Abdullah, measurement of total factor productivity for the Malaysian rice sector (paper), HUM Journal of Economics and management 5, no. 2 (1997): 67 - 95.

John M.Antle and Susan M. Capalbo, An introduction to recent developments in production theory and productivity measurements. Agricultural productivity measurements and expiation, Washington D.C: Resources for the future, 1988.

Shiomo Maital, Total factor productivity as a performance benchmark for firms: Theory and Evidence, Technion-Israel Institute of Technology and MIT Sloan School of management (smaital@mit.edu).

Subhash Ray, measuring scale efficiency from a translog production function. Journal of productivity Analysis. 11, 183 - 194 (1998),Kulwer Academic Publishers, Boston.

Byungtae Lee and Anitesh Barua, An integrated assessment of productivity and efficiency impacts of information technology investments: Old data, new analysis and evidence. Journal of productivity analysis. 12, 21 - 43 (1999), Kulwer Academic Publishers, Boston.

6 The Islamic Gold Dinar: Socio–Economic Perspectives

Ahamed Kameel Mydin Meera,
Hassanuddeen Abdul Aziz
Department of Business,
Universiti Islam Antarabangsa Malaysia (UIAM).

Abstract

This paper looks into the prospects and challenges of introducing the Islamic gold dinar as a complementary currency within and among Muslim nations. It highlights the socio-economic impact of the current fiat money interest based monetary system; and by taking the recent 1997 Malaysia financial crisis as an example, this paper argues that the gold dinar is a desirable alternative money, viewed from social, economic, political and religious perspectives. Assisted by developments in the Information Technology and internet, the gold dinar seems ready to take on the world, both Muslim and non-Muslim.

INTRODUCTION

A renewed interest in gold as a medium of exchange seem to have taken upon globally, Muslims and non-Muslims alike. Many scholars and economists (Muslims and non-Muslims; past and present) have argued in preference for gold over paper money (to be precise fiat money) to play the role of money.1 Till late, such arguments had fell on deaf years since nations were generally "satisfied" with fiat money or at least the negative effects of fiat money went unnoticed or viewed as not threatening. After all, the implementation of a gold payment system would require significant changes in the financial infrastructure of a nation, thus indirectly requiring strong political will. Even with political will a nation may look disassociated from the rest of the world. Hence the views and preference of scholars and policy makers in favour of gold were subdued and nations were forced to use fiat money by the dominating global financial force.

Nevertheless, gold was part of the international monetary system for centu-

ries until the collapse of the Bretton Woods system in 1971. A floating exchange rate system replaced the fixed rate regime of the Bretton Woods. Now within thirty years, this system too is showing signs of collapse. The three world major economies, the United States, Europe and Japan are all simultaneously showing signs of distress, a phenomenon never observed before. It is increasingly clear that the fiat money system is at the root of this and hence thereby rekindling a renewed interest in gold. As a parallel complementary system, electronic gold payment systems are already in operation globally – examples include e-gold, e-dinar, gold-economy, GoldMoney etc. A renewed interest in other complementary currencies is also observed. Peter L. Bernstein wrote:

In March 1997, long before he knew he would be honored with the Nobel Prize, [Robert] Mundell had predicted that "Gold will be part of the international monetary system in the twenty-first century." This was a bold and controversial statement, and perhaps an ominous one. Gold may again serve as the ultimate hedge in chaotic conditions. Its return to its traditional role as universal money is unlikely, however, unless the time should come when the dollar, the euro, and the yen have all failed to function as acceptable means of payment across international borders.[1]

This paper discusses the problems inherent in the fiat money system and argues in favour of the gold payment system from economic, social, political and religious perspectives. Finally, the prospects and challenges of introducing a gold payment system – like the Islamic gold dinar – are discussed.

GOLD DINAR – THE ISLAMIC CURRENCY

The word dinar refers to gold coins used as a medium of exchange by Muslims through out the Islamic history until the fall of the Ottoman caliphate. Dirhams, which were silver coins, were also commonly circulated. However, the dinar and dirham were in circulation even before the advent of Islam but continued to be used by the Prophet s.a.w.. The dinar was the bezant gold coin whereas the dirham was the silver coin of the Sassan. Any practice allowed by the Prophet s.a.w.[2] is considered as a tradition and is thus necessarily just and in accordance with Islam. Islam's own dinar coinage was first issued in Damascus by Caliph Abdul Malik ibn Marwan in the year 77H. With the spread of Islam, the dinar was minted in large quantities and gradually displaced the bezant gold coin as the major international currency, circulating throughout the Muslim world and the Christian Europe as well.

Prophet Muhammad s.a.w. is reported to have said that "A time is certainly

1 Bernstein Peter L., The Power of Gold, John Wiley, 2000, pg.372.

2 The words dinar and dirham are preserved in the Holy Qur'an in the verses Al-'Imran (3):75 and Yusuf (12:20 respectively. Dinar and dirham are derived from the Byzantine words denarius and drachma respectively.

coming over mankind in which there will be nothing [left] which will be of use save a dinar and a dirham".[3] This stresses the intrinsic value that is in gold. The Muslim scholar Ibn Khaldhun (1332-1395 C.E.) claimed that God created the two precious metals, gold and silver to serve as a measure of all commodities. His younger contemporary and student, al-Makrizi (1364-1442 C.E.) asserted that only gold and silver can play the role of money.

In a technical sense, the Islamic dinar is thus a commodity money (i.e. precious metal currency). The dinar was equivalent to 4.3 grams of gold while the dirham was 3 grams of silver. Since the exchange between the dirham and dinar were fixed, the Islamic economies of those days basically operated on the gold standard.

PROBLEMS IN THE CURRENT MONETARY SYSTEM

Understanding the nature and effects of the current monetary system adopted by most countries is crucial in understanding the benefits and superiority of the gold dinar system. Current monetary systems are generally inflationary and amplify business cycle effects. These effects with other social effects will be discussed shortly. We assert here that the root problem lies in the nature of money as defined in the existing monetary system. The understanding that the Islamic Gold Dinar is a viable solution to the current economic woes lies in understanding the nature and implications of current definition of money. There are a few important features about current monetary systems that we need to know in order to comprehend the phenomenon. Three particular features are: (i) fiat money (ii) fractional reserve requirement and (iii) interest.

Using a famous identity in economics called the equation of exchange, the relationship between interest rates, money supply and the Malaysia economic crisis is shown. The destabilizing role of interest rate, its effects on asset prices and debt financing at various stages in a business cycle and its socio-economic effects are stressed. Using theoretical arguments and statistical facts, it is shown that fiat money, fractional reserve banking system and interest rates are fundamental to the cause of the crisis.

MONEY CREATION: THE MAGIC OF FIAT MONEY AND FRACTIONAL RESERVE BANKING

The first thing that one should know in order to understand the dynamics of contemporary economic cycles is that fiat money with fractional reserve banking enables the banking sector to create money. It is the banking sector that gives birth to money by means of the fractional reserve requirement through multiple deposit

3 Musnad of Imam Ahmad ibn Hanbal.

creation. Money is born or created when banks extend loans. Hence money in most part is only an accounting entry in books or a computer record in the form of binary bit memory space.

This increase in money through multiple deposit creation is a one-time increase in the 'money base'.

The formula for multiple deposit creation may be written as follows:

$$D = \frac{1}{r} \times R \qquad (1)$$

Where:

D = Change in total checkable deposits
r = Required reserve ratio
R = Change in reserves

Hence if the reserve requirement is 10 percent, an initial deposit of RM1,000 can bring about a total deposit of RM10,000.

INTEREST RATES AND MONEY SUPPLY GROWTH

In addition to multiple deposit creation, interest rates given and charged by banks also increase money supply in the long run.[4] This point is pertinent and fundamental to our argument for the cause of the financial and economic crises. Therefore in this section we expound and elaborate on this matter.

In a system as above, in the long run, the central bank would be forced to continually increase fiat money and/or the banks would *continuously extend loans* to the public and private sectors so that the reserve requirement can be met and thereby *sustain the system.*[5] The implication of this is that the existence of interest rates would themselves, ceteris paribus, force a continuous increase in both state money (fiat money) and bank money (loans). Hence with the simple existence of interest rates alone, under normal circumstances, money supply in an economy will grow *by default.*

CREDIT CARDS AND GROWTH IN MONEY SUPPLY

It is interesting to note that the credit card system also increases the money supply. This is because every credit card transaction is a credit transaction where one account gets debited while another credited. The credit entry is interpreted as

4 See El-Diwany, Tarek, The Problem With Interest, TA-HA Publishers, United Kingdom.
5 Historically, in most countries the public and private sector debts have continuously grown to sustain the system.

a deposit and thus is subject to reserve requirements that allows further money creation.

Apart from this, the bank also has an additional way to create money – i.e. when a card owner fails to settle his/her monthly account. When one fails to settle one's monthly balance statement, then the Bank will impose two charges: (i) interest on the balance! and (ii) a late payment fee! These charges are imposed even though the bank did not pay anything tangible in the first place. It is all in accounting![6]

While it is possible to reduce (or control) money supply in the short run, for example by increasing the reserve requirement ratio or through open market operations (i.e. the selling of government bonds or by increasing bank discount rates), we postulate that the net long run effect will still be an increase in money supply. This is simply due to the existence of interest rates in the economy (note that government bonds too pay interest even though the money obtained through the sale of such bonds may be simply kept in the vaults).

However, it is possible for this money supply to shrink back if a depositor withdraws cash from the banking cycle (and keeps it from reentering back into the financial system), or when a loan is repaid, or when a borrower defaults on loan repayment (which at serious levels may cause banking crises, as was the case with non-performing loans (or NPLs) during the 1997 Malaysian financial crisis).

Therefore, in an interest-based fiat money monetary system, money supply simply grows in the long-run, even though in the short-run it may be altered through monetary policies. However by the reverse process, the created money can also be destroyed in the event deposits are withdrawn, loans repaid or borrowers default on loan repayments.

MONEY SUPPLY, THE REAL SECTOR AND THE AGGREGATE PRICE LEVEL

Having discussed the growth in money supply in the long-run, this section discusses the relationship between the money supply and the real sector. An interesting fact to note is that, in many economies the money supply grows faster than the real economy. Table 1 provides the time series data for a selected set of Malaysian economic variables. Note that while the real GDP (at 1978 prices) grew on average at 8.5 percent[7] for the 1986 -1996 period, the money supply in the economy however grew at 15.81 percent.[8]

6 Now we know why banks work hard to place credit cards in our hands!

7 It is rather impressive for the real sector to grow at 8.5%.

8 Note here that the average deposit rate and lending rate for the period add up to 14.07%, consistent with

Monetarists show the link between the monetary sector and the real sector using the equation of exchange, which relates the nominal income to the quantity of money and its velocity of circulation. The equation of exchange is generally shown as below:

$$M \times V = P \times Y \quad (2)$$

Where M is the money supply; V is the velocity or the number of times per year the average dollar is spent on goods and services; P is the aggregate or average price level; and Y is the real output of goods and services produced in the economy.[9]

Therefore, with the velocity of money circulation practically stable in the short run, this imbalance of growth between the money supply and the real sector will be thus reflected in changes in the aggregate price level. Since the money supply grows at a much higher rate than the real sector, there will be a tendency for prices to increase (i.e. inflationary pressure), i.e. eroding the purchasing power of money. The quantity theory of money suggests that for the period 1986 – 1996, the Malaysia aggregate price level grew at an average rate of 6.73 percent per annum.[10]

Since there is an imbalance of growth between the real sector and money supply, with money supply growing much faster, in this kind of system then, there will be pressure on almost all goods and services, including basic food items, to increase in price unless controlled through regulation. It is thus common in most countries to control the price of basic food items like rice, flour, sugar, meat and chicken. Otherwise frequent price increases of such items can cause social unrest and may lead to political problems. This control in prices nevertheless would only cause the money supply growth to find its way into other sectors in the economy and thus be imputed in price increases of other items in the economy. This inflationary pressure on aggregate price level would be much more apparent after the attainment of full employment and the potential GDP. This accelerated price increase is also termed as asset price bubbles. Malaysia experienced this period when full-employment level was attained in 1994 with an unemployment rate of 3 percent (See Table 1).

Therefore fiat money interest based system causes asset price bubbles particularly after the potential GDP levels have been reached. This general price

---

our argument that these rates together contribute greatly to money supply growth. The difference is partly due ti the compounding factor that is ignored here.

9 Note that MV is the monetarist counterpart of C + I + G + X in the Keynesian, that we normally see in Macroeconomics textbooks. MV is the total amount GDP in turn equals PY which is the price level times physical output of goods and services.

10 Muslim sholars of the past including. Ibn Taymiyya and al-Maqrizi strongly opposed such overproduction and debasement of money. Al-Maqrizi pointed out that this would constitute injustice (zulm) particularly on fixed wage earners.

increase necessitates price controls for basic necessities.

MONEY CREATION AND ECONOMIC CYCLE

This money creating mechanism of the fiat money interest based system is at the root of the economic cycles that we have taken for granted as part of life. The cycle may be divided into the following phases:

1. Period of money creation without much inflation.
2. Period of excess money supply with cheap funds – inflationary.
   After potential GDP has been reached, excess and still growing money supply would bring about lower interest rates and marked asset price bubbles, particularly in sectors that enjoy easy access to bank credit (like the financial and property sectors). It is interesting to note that falling or low interest rates preceded the previous bull runs in the Malaysian stock market.[11] The easy and cheap access of credit during excess money supply periods would also tempt businesses (and individuals) to simply borrow money, particularly to invest in properties and shares, which now seem very attractive investments. This easy access to credit would show up in increased debt-equity ratios for firms.[12]
3. Period of destruction of money supply – economic downturn with financial distress and bankruptcies.
   At high asset price bubbles, investors "come to their senses" and re-evaluate their holdings.[13] At this point, realizing the absurdity of their position, investors adjust their portfolios by liquidating (i.e. selling) some of their share holdings, thus starting the avalanche of stock prices and hence the beginning of a bear market; the beginning of an economic downturn.

   As the stock market starts to fall, it has some serious implications for a fiat money interest-based economy. Many businesses and individuals who have invested in the stock market with borrowed money[14] in periods immediately preceding the peak would find the net worth of their investments falling below the loan principal that they had taken to finance their share purchase earlier. Banks may "confiscate" their collateral and further require them to pay up the difference. Some may fail to service this debt and thus be forced to

11 See Kean, Neoh Soon, Stock market Investment in Malaysia and Singapore, Berita Publishing, Kuala Lumpur.

12 Finance theory of capital structure asserts that firms should go for their optimal capital structure based on the level of business or market risk it bears. A common measure for thumb, we may say a high beta firm should not go for high leverage (borrowing) while a low beta firm may.

13 For example, at the hight of the 1973 bull-run, OCBC share was selling at $50 per share at a time when it had 60 million shares. This puts a market value of $3 billion on OCBC, a value larger than a quarter of Singapore's 1972. Gross National Product! See Neoh Soon Kean, pg. 165. Similary at the peak of the last bull run, the share price of Kluang Plantation was RM175 (on January 17, 1997) with a Price-Earnings ratio of about 222!

14 Particularly those who are further leveraged.

declare bankruptcy. The failure to service debt has serious implications for the financial sector - i.e. contraction of money supply. As the fractional reserve banking system was able to multiply money through money creation, defaults on debt service would then, by the reverse process, contract money supply, thus causing a shrink in money base. This feature of destruction of money is unique to fiat money with fractional reserve requirements. Many loans may in fact become non-performing loans (NPLs).[15]

From the equation of exchange (equation 2) we can see that the immediate effect of this is a fall in aggregate price level.

Therefore, as the money supply contracts, the stock market and the property sector that absorbed the excess money supply earlier would ultimately be forced to give in; prices in both the sectors would observe a sharp decline.

4. Period of transfer of crisis from the financial sector to the real sector.
Since debt service and salary are usually fixed expenditures in a firm's accounts, firms may resort to retrenching workers in order to save cashflows for debt servicing purposes.[16] This is where the real problem lies. Such retrenchments are extremely bad for economies because they cause increased unemployment,[17] which in turn would push down aggregate demand and cause a shrink in economic activity (i.e. lower production of goods and services) leading to a recession. Debt transfers the crisis from the financial sector to the real sector.
5. Period of recovery that takes us back to Period 1.
What should be done to reverse the cycle? It is clear from the discussion that the fundamental thing that needs to be done is to reverse the shrinking money supply in the nation and give back the jobs to those who were retrenched in order to stimulate the aggregate demand and the real economy.

With the necessary steps taken by the financial sector and the central bank, the economy may start to recover. The money supply in the economy would be mostly absorbed into productive sectors first. Thus, unemployment rate would begin to fall and increased amounts of goods and services would be produced in the economy (i.e. a growth in the gross domestic product). This growth would continue till the productive capacity of the economy is exhausted at the potential GDP, and the ever increasing money supply find its

15 NPL's shrink money supply through the reverse process of money creation. This also means a shrink in loanable funds in the banking and finance sector; a reason why in Malaysia we had difficulty in obtaining loans for almost anything during the crisis time.

16 How fortune if only firms could retrench their loans instead!

17 Notice that unemployment is simply the separation of labor from capital (or the production process). The worker would be on the streets separated from the machinery that he used to work with, while the machinery would stay idle. An unemployed worker would most likely want to work. His unemployed status is simply caused by hiccups between the monetary and real sectors. Property ownership rights further assist this. For example, if land has no ownership rights, then an unemployed person could go into the forest and make a living – build a hut, plant food, hunt etc. But in today's world with ownership rights, an uncultivated land may have a signboard that reads "Trespassers Will Be Prosecuted!" and thus prevent others from toiling the land. In human history before the advent of fiat money rarely do we hear of unemployment being recorded.

way into unproductive sectors, bring about rallies in the stock market, increase property prices and thus start the whole cycle again![18]

ISLAMIC BANKS, MONEY CREATION AND THE LAW OF ONE PRICE

In many nations, including Malaysia banks are operating presumably on Islamic Shari'ah principles. The banks claim they do not indulge in interest or riba that is strongly prohibited in Islam, and also design their financial products and instruments based on the Shari'ah principles. The banks should be commended for coming up with such products and instruments that strive to provide Muslims with an alternative banking and finance which are in line with the teachings of Islam. However, it should be noted that in a dual system where the Islamic bank operates in a fiat money and interest based financial system, the banks would also be creating money! Thus, instead of being a solution to the problem, the Islamic bank becomes a cause of the problem too, just like the conventional bank.

In the dual system where the Islamic bank is linked to the conventional banking system through fiat money, fractional reserve requirements and interest rates, the bank cannot operate independently from the conventional banking system according to its own principles. This is because arbitrage opportunities would set in if there are any "price" differentials between the Islamic and conventional systems. Profiteering such arbitrage opportunities would move the pricing in these two systems to converge, a force in economics called the Law of One Price.[19]

Therefore, in the present system the Islamic bank cannot be independent from even the interest rates in the economy, the very thing it tries to avoid in the first place![20] In fact it is only a matter of time even the Islamic Banks would be gobbled up by the foreign giants in this era of globalization. Therefore, for an Islamic bank to truly operate on Islamic principles, it is imperative to redefine money and eliminate interest rates.

FIAT MONEY AND CURRENCY SPECULATORS

Fiat money enables currency speculation and arbitrage to thrive. The East Asian crisis including the 1997 Malaysian currency crisis are examples of such activities. The Ringgit depreciated from an exchange rate of about RM2.47 to a US dollar before the crisis to a rate of RM4.80 at some point in time during the crisis. Malay-

18 Here we go again!

19 Both the Islamic banks and conventional banks are in the market for credit and people would tend to go for the cheaper credit. Any difference in pricing would be arbitraged away. Such profiteering may be avoided if the market is segregated though, i.e. only Muslims can deal with Islamic Banks and only non-Muslims can deal with the conventional Banking. Nevertheless this may be highly undesirable, at least for the reason we cannot deny non-Muslims from dealing with Islamic banks; for to bring humanity towards Islam is what the religion strives for.

20 Ask about this from any Islamic Bank manager.

sia being a highly open economy was thus faced with a serious exchange rate risk. Currently there are no adequate financial instruments available to hedge the Ringgit exchange rate risk. Neither futures nor options market on the Ringgit exist, to manage foreign exchange risk. The speculators are not the root cause of a crisis. However, their aggressive collective actions do make things worse during a crisis.

The fiat money interest rate system provides a fertile ground for speculative, manipulative and arbitrage activities in the foreign exchange market.[21]

SOCIO–ECONOMIC EFFECTS OF MONEY CREATION

The socio–economic effects in question are attributable to the increase in aggregate price level due to money creation, which may be called general inflation.[22]

It may not be a problem if everyone's income had risen at 6.73% also for the said period, for as such, the real income or the purchasing power of income would have remained constant. However, it is a fact that not everyone's income would have risen at 6.73% because this growth rate is an average for the whole economy. Some individuals would see their income growth exceed 6.73% while others would note their income grew at a rate lower than this.

In the present money creating mechanism, sectors for which easy credit is given would experience higher price growths, like the properties sector and the stock market. Therefore those in these sectors, like developers, stockbrokers, remisiers and investors would experience an aggregate average income growth of higher than 6.73%.[23] However, many wage and salaried people would find their income grow at a rate lower than 6.73%. This disparity in income distribution is something to be concerned about for it brings about with it a host of socio–economic problems. This disparity in income distribution is further worsened by the existence of interest rates.

It is a feature of interest rates to concentrate wealth in the hands of a minority rich by taxing the bottom majority.[24] In a 1985 German study, a systematic transfer of wealth (about DM35 billion) from the bottom 80 percent of population to the top 20 percent was observed. Such concentration and circulation of wealth among the rich is discouraged in Islam.[25]

---

21 Back in 1970's, the daily global volume of foreign exchange transactions was around $10 - $20 billion. By 2000, the average transaction was around $2 trillion. See Lietar, Bernard, "The Future of Money", Century, 2001, Pg. 312.

22 This aggregate price level is not measured by the consumer price index (CPI) because the consumer price index tracks the prices of only a selected basket of goods, which are basically necessities.

23 Probably not during a downturn though.

24 See Bernard Lietaer, "The Future of Money", Century, 2001, Pg. 50-55.

25 al-Qur'an 59:7.

DISPARITY IN INCOME DISTRIBUTION AND CREATION OF POVERTY

Now those with an income growth rate lower than 6.73% would find their purchasing power eroding gradually. This is simply logical since their income grows slower than the general inflation (aggregate price level). The dynamics of this system would push a group of people into relative and absolute poverty. Those with very low or no income growth would be seriously affected such that their purchasing power could fall below subsistence level, pushing them into absolute poverty levels. Therefore in the present fiat money interest based monetary system poverty is automatically and continuously created!

On the other hand, a small group would enjoy a much higher growth in income than the growth in the aggregate price level. Generally, this group would include those in the finance and banking sector (the sector that creates money), and those in the sectors that significantly absorb the money supply like the property sector and the stock market.

Such disparity of income among groups would bring about an inequality in income distribution. The dynamics of the money creating system would cause this disparity in income distribution to widen and widen. At the global scale for example the richest 358 people in the world own more wealth than the poorest 2.5 billion people.[26] Such statistics would surely be impossible to observe if not aided by the money creating system.

EFFECTS ON HOUSING

Since the property sector is one of the sectors that absorb money supply, the price of houses and stock investments can thus be expected to grow at an average rate higher than 6.73%.[27]

A growth in the price of housing of higher than 6.73% is likely to be burdensome on the lower income group. This may necessitate government intervention on the housing issue for the low-income group.

Housing for Low-Income Group

If the price of housing is not controlled, the money-creating system would place a burden on the low-income group. This means in due time, housing for this group will not be landed.

26 United Nations Human Development Report, 1996

27 Even in economic downturns, these sectors still enjoy better attention from government authorities.

Size of Homes Shrink Gradually; Duration of Loans Extended

Since in the money-creating interest based system the majority of people will have their income growing lower than the aggregate price level, the purchasing power of their income keep falling. Property developers would respond to this by building smaller and smaller sized homes so as to make them "affordable".

At this juncture the banking sector comes to the "rescue" – by giving longer durations to settle housing loans. In the 1970's the average housing loan duration in Malaysia was about 10 to 15 years. In years before that, loans for a period of even less than 10 years were common. But now most banks would even go for 35-year housing loans!!

EFFECTS OF PRICE CONTROL ON AGRICULTURE

Since most of the price controls are on agricultural products, in our money-creating economy, agriculture would become less attractive compared to sectors that do not face such controls - like manufacturing or construction. Self-sufficiency in food may not become a priority in economic planning. The effect on agriculture must be viewed seriously since agriculture is basic to human survival.

EFFECTS ON SOCIETY

Earlier we had postulated that the fiat money interest based economy automatically creates poverty. While poverty is generally an economic phenomenon, it brings about a host of social problems. For example, it would gradually warrant the women folk to work in order to sustain her family (particularly of the lower income group that finds its purchasing power ever eroding). The negative side is that in many cases their employment outside home may contribute to many social problems. In the work place it may contribute towards (i) sexual harassment (ii) zina or fornication (iii) gender jealousy (iv) higher divorce rate etc.. At home front, her employment has implications for family solidarity and child rearing, bringing about issues like child neglect, child abuse etc. In extreme cases child labor may be necessary for the sustenance of the family.

The issue of shrinking home size that we discussed earlier may add to this problem. Due to the limited home space, children may spend most of their time outside the home and may return only in the evening for sleep. Such children are likely to face the following: (i) sibling rivalry and conflict (ii) poor diet (iii) poor education and academic performance (iv) early drop-out from school (v) bad peer and external influence (vi) likely to have problems with the law.

EFFECTS ON ENVIRONMENT

The fiat money interest based economy also has numerous effects on the environ-

ment; both the physical environment and social environment. On the social front for example, the struggle to survive in the economy, particularly by those at the lower strata may cause them to resort to crime. Therefore as the system creates poverty, it also creates crime. Hence crime may become part and parcel of the money-creating economy. On the physical front, the struggle to survive may also cause the environment to be blundered and destroyed. The existence of interest rates also contributes to this environmental destruction by making myopic business decisions feasible. For example, if the interest rate is 10 percent, it becomes a viable business venture to cut down trees, sell the wood and invest the money at the 10 percent interest rate. This is because the trees themselves do not grow at 10 percent per annum.

MONEY CREATION AND SOVEREIGNTY

Money creation would cause a gradual shift of power into the hands of those who control the financial system. With foreign financial institutions like banks operating, a gradual loss of sovereignty is likely to be seen in the land.

The banking system, apart from creating money through loans, also evaluates loan applications and decides to whom the "created money" would be extended out as loans. In such an economic system therefore, while it is the workers and businesses who produce the real output and services, it is the banking sector that decides who would have the purchasing power to buy those output.[28]

Indeed this is a very powerful position because with the extra money created in the system the banking sector gains indirect but significant power over control of assets in the economy. Most local banks are tiny compared to those foreign giants. In the current era of globalization, the large foreign banks could easily gobble up these small-fry local banks.[29]

Therefore in order to protect its sovereignty and to promote a just monetary system, a nation may have to redefine money and eliminate interest rates from the economy. The next section discusses a promising alternative – The Islamic Gold Dinar - which in our view, is capable in overcoming most if not all of the shortcomings and negative effects of the present day fiat money interest-based system.

THE ISLAMIC GOLD DINAR SYSTEM

The Islamic Dinar

While in Islamic history, the dinar and dirhams were metal coins, the Islamic Dinar

28 This is a statement in the aggregate sense.

29 In Malaysia the recent bank mergers exercise was apparently to prepare them for globalization. However,

system being proposed in this modern era is basically an electronic payment system that is gold backed. Transactions can be carried out through the internet by means of electronic transfers but nevertheless all transactions are backed by gold. This innovation from the traditional dinar is to avoid the burden of having to carry gold around for reasons of convenience and safety. The card system (debit cards, credit cards etc.) can be incorporated into this gold payment system too. Nevertheless, the basic principle of gold as money is preserved.

Implications of the Islamic Gold Dinar System

Compared with interest–based fiat money, the implementation of the Islamic dinar has a number of implications. The following are some important ones:

1. Stable Money
   Since dinar is gold itself, the creation and destruction of money as in the present system is impossible. In the current system the creation of money by the banking sector is possible due to fiat money and not because of the fractional reserve system as is commonly thought to be the cause. Fractional reserves is a necessary condition for money creation but not sufficient. It is fiat money (money not backed by gold) that provides the sufficient condition. Money creation by the banking system would not be possible in a fully gold backed system even with fractional reserve requirement. The elimination of both money creation and money destruction is the biggest advantage of the dinar system. If gold coins were used, then counterfeiting would also be checked. In fact in the current electronic commerce era, counterfeiting should be largely eliminated. In the present paper-money system, such counterfeiting would bring about inflationary pressures.

   Therefore, with dinar and the elimination of interest, we would have a stable currency and monetary system.[30] The value of the currency in terms of its purchasing power could be expected to be stable over time. Hence the dinar could play its role as a store of value much better than the fiat money in an interest based economy.[31] The dinar's value comes from the value inherent in itself, for people adored gold since time immemorial.[32]

   With the introduction of the dinar and the elimination of interest from the economy, money supply growth (from new discoveries of gold) can be expected not to overshoot growth in the real sector, thus eliminating the inflationary pressure in the economy. It is almost like barter trade but with all the problems of barter trade – like double coincidence of wants – removed.

---

even with such mergers these banks are still small compared to the large foreign banks.

30 The purchasing power of dinar and dirham remained stable for long periods of time. Al-Maqrizi, Ighathah, pg55.

31 A chicken at the time of the Prophet s.a.w. is said to have cost one dirham as it approximately costs today 1400 years later.

32 So long there are women folk in this world gold will have value!

The dinar is consistent with the current phenomenon where banks are being replaced by commodity based payment systems.

Even if for argument's sake one thinks that it would be cumbersome to deal with gold currency (e.g. for reasons of convenience and safety), one could still initially introduce it in a dual system, i.e. paper money and gold standard. Large transactions like consignments, international trade and so forth could be done within the gold dinar system while small day-to-day retail transactions could be done using paper currency. This would still bring some stability into the economic system since the significant portion of exchange rate risk embedded in international trade transactions would now be eliminated.

Excellent Medium of Exchange

Since gold is priced and revered globally, it is something that is always valued by people of all nations and creed. With increasing population and economic activities but with limited gold supplies, the long run effect is a gradual increase in gold price. Only in the short run some fall in gold price may be observed. Owing to its inherent value and its easy divisibility, gold is an excellent medium of exchange.[33] If a trader is given a choice today that he be paid for an item purchased using a thousand dollar paper note or a gold coin worth a thousand dollars, he would most probably go for the gold coin. Therefore people are not likely to behave indifferently between paper notes and gold coins. For this reason the dinar could easily play the role of a preferred global currency. Hence the dinar is also not a legal tender in the normal sense of word, unlike the case of paper money. Paper money is a legal tender since one needs to be "forced" by law to accept them for payments.

Minimizes Speculation, Manipulation and Arbitrage

Since the dinar is based on gold, it is like a single global currency. The speculative and arbitrage activities that take place in the current system and profits therein, are made possible due to the existence of different currencies and the cross exchange rates between them. These exchange rates constantly fluctuate, either due to forces of demand and supply for the currencies or even manipulative attacks. If all these exchange rates are eliminated by means of a single currency like the dinar, then speculation, arbitrage and manipulation will be very much removed if not eliminated. This would further strengthen and stabilize the economy.[34]

33 Gold is a scarce, inactive and homogenous metal, that is portable, divisible and durable with a pleasing colour that makes it alluring to men. These characteristics make it ideal for use as money.

34 We should remember that such speculative attacks worsened the financial and economic crisis in 1997 East Asia crisis.

Business Cycle Effects Minimized

With money supply growth "suppressed" in the dinar system, growth in aggregate price level and debt will be much curtailed. We showed earlier how the dynamics of money supply brings about a business cycle. Now with money supply growth leveled, the business cycle and its effects would be very much reduced if not eliminated. A greater stability in economic and business activities would thus prevail. A stronger and stable "marriage" between labor and capital would take place, such that unemployment due to economic downturns and recessions would be minimized if not removed.

In the dinar system, each transaction is an exchange within the real sector; unlike in the present system, transactions are between something that is real (goods and services) and virtual (binary bits of a computer). The dinar itself is real, something valued by society. Transactions are instantaneous and take place with actual funds. No intermediate credit is created like that with credit cards in the interest based monetary system. All the above would bring about a harmonious relationship between the monetary sector and the real sector.

Dinar Diversifies Risk and Promotes Trade

When countries unify their currencies, just like the Euro,[35] then unique risks inherent in the individual currencies will be diversified away. Only risks that are common to all the united currencies would remain. Hence exchange rate risk would be totally eliminated among those countries. However, the dinar is even better than Euro because gold is something that has intrinsic value and treasured by all nations. It thus acts as a unified global currency unlike Euro which is a unified regional currency. Therefore the use of dinar also negates the need for derivative markets like currency futures or options markets for exchange rate risk management, thereby promoting economic stability and efficiency.

A unified currency also significantly reduces transaction costs. When one imports or exports goods, one no longer needs to change currencies which involve transaction costs (which is income to money changers and banks).[36] This in turn would promote international trade among the nations that adopt the common currency.[37] While the Islamic Gold Dinar is held as Shari'ah currency, it is not a system alien to non-Muslims. As mentioned earlier, in fact dinar and dirham were in existence from pre-Islamic days but adopted by the Prophet (peace be upon him). Since dinar simply refers to a particular quantity of gold, the system could thus easily accommodate transactions with non-Muslims.

35 The Euro is the single common currency for twelve European nations from 1st January 2002.

36 The transaction cost is the difference between the buying rate and the selling rate of a currency.

37 Remember how Islam spread during the earlier days, and when dinar was used from Morocco to Malacca? A vast network of trade was then established.

Dinar Promotes a Just Monetary System

Since the growth in money supply would be in harmony with the real sector in the dinar system, it thus promotes a just monetary system. Growth in aggregate price level will not be as that we see in a fiat money interest based monetary system. The harmonious growth between the real sector and the monetary sector would preserve the purchasing power of money and income. Therefore price controls of even basic necessities would not be necessary. In the dinar system therefore, all economic sectors including agriculture will get fair treatment. Dissatisfaction among producers of agricultural products, land conversions from agriculture-based to other categories would thus be minimized.

Some Social Problems Reduced

Earlier chapters argued that interest based monetary system promotes the following, particularly for the group with its income growth lower than the growth in aggregate price level:

1. Poverty through the erosion of purchasing power of income.
2. Unequal distribution of income / Unfair transfer of wealth.
3. Forced women and child labor.
4. Child neglect and "lepak"[38] among children.
5. Poor housing.
6. Poor diet.
7. Poor health.
8. Poor education.
9. Promotion of crime.

In the dinar system, with stability in the purchasing power of money and income, all the problems above would not be promoted. If such a society also has a zakat system in place, then the income of the lower group could be supplemented effectively for the eradication of poverty together with all its evil consequences, while promoting employment.[39] The income distribution would be more equitable if not equal and would release the necessity for women and children's labor for economic survival as that which happens in some nations with rich resources.

With the dinar system a lot of time will be released for other purposes – for now only a smaller fraction of time used for earning a living. In the interest based monetary system time is "robbed" away from the people. But now, the time released

38 Lepak is a Malay term referring to the wasting of time by loitering around particularly in the city without engaging in some productive activities.

39 Please read about demurrage and creation of work, employment and wealth in Bernard Lietaer, "The Future of Money".

could be used for family gatherings and outings, ziarah[40] and ibadah.[41] A more balanced society could thus be developed.

Sovereignty Protected

Notwithstanding all the benefits mentioned above, probably among the most important benefit of all is that the dinar system would protect the sovereignty of nations from economic and cultural dominance by foreign forces.

SMOOTH TRANSITION THROUGH INFORMATION TECHNOLOGY

Before the advent of information technology (IT) and computers, the implementation of a dinar system necessarily required a political will from a nation that desired such a system. However with the blessings of IT, an initial dual system is made possible. In other words the current fiat money and dinar may coexist initially while a transition takes place gradually. This is highly desirable because it would provide a transition that is soft and smooth without any sudden and abrupt shock to the economy.[42]

Therefore in this context, one of the great benefits that IT has brought about is that a political will is no longer necessary for the implementation of the dinar system. What matters now is the will of individuals and businesses to recognize and adopt the dinar as their choice currency. These individuals and businesses could connect themselves through the internet and transact among themselves using electronic money with gold backing. However, a political will would certainly be an added bonus to the system.

---

40 Visiting friends and relatives.

41 Spiritual upliftment through worship and prayer.

42 The current interest based monetary system is like "slavery". Eradication of slavery must take place gradually so as not to shock and rock the economy. For example one may compare the eradication of slavery in Muslim nations and in the United States. While Islam abhors slavery, it never made slavery haram (forbidden). It gradually eradicated slavery through its religious laws. For example if one were to commit a certain sin while fasting in Ramadhan, then one must release a slave as expiation for that sin etc. Through such laws slaves were released only gradually. A release was then a moment of happiness for all. First the slave would be happy for his release. He may even celebrate his release annually just like a birthday. The owner would be happy since he gets back the price of his "investment" (slave), which is now abhorred in his religion. The releaser would also be happy since his sin would be forgiven. This slow release of slaves would also give chance for them to look for jobs in the economy as free persons. The economy would not be thus abruptly affected by such releases. Contrary to Islam, notice what happened in the U.S. The sixteenth president, Abraham Lincoln abolished slavery by law, and thus opened the dam gate. This sudden release of slaves caused a lot of economic and social problems. The owners of slaves mostly did not agree to this new law. Not only they did not get paid for their slaves, the sudden release caused labor shortages particularly in farms. The slaves too faced serious opposition from their masters and their enblock release naturally caused unemployment (for they were not owners of land or other properties at all). This was also a cause of civil war between North and South states. Even though today African Americans are freemen in the U.S. they have not assimilated well with the whites. Some animosity between the two still remains.

FUTURE PROSPECTS AND CHALLENGES

The Future Prospects

The Islamic Gold Dinar or any gold payment system has excellent future prospects for a number of reasons. Some of these are:

1. Many people are aware of the shortcomings of the present system and advancements in IT technology are promising a way out- Hence the emergence of e-dinar, e-gold, GoldMoney etc. With the blessings of IT, political will is not necessary and a gradual introduction of the dinar is possible without adversely affecting the current system. Hence the dinar may be implemented as a complementary currency along with the national currencies.
2. Does not require substantial new regulations. The system is as easy as where people invest in gold, but for some aspects of the system – like transfer of gold between nations etc. – some regulations are necessary. In Malaysia for example the compliance of the system to Banking and Finance Industry Act (BAFIA) need to be looked into.
3. With the advent and staggering growth in e-commerce, e-money is unavoidable.
4. Gold has a high prospect as a single global currency. It had earlier played this role for centuries. Just consider the obsession humanity has had for this metal since historical times.[43]
5. The simultaneous economic distress in the US, Europe and Japan is warranting people to ponder over the underlying causes.

The Challenges

The Islamic Gold Dinar is of course not without its challenges. Some of these are:

1. Institutional setback. After the cold-wars, the US had emerged as the sole superpower in the world today. The US dollar plays the role of international currency. Hence introduction of a new system must be preferably one of a win-win situation. While the gold payment system is argued as beneficial to all parties concerned, it depends on how the US sees it.
2. Possible attempts to fail the system. Since the current fiat money interest based system is advantageous to a minority, there may be attempts by this group to sabotage the system. For example, like playing with the global supply and demand of gold to manipulate its price.
3. The success of this system depends on a gradual increase in the number of people using gold as money. This may need education and marketing.
4. The initial dual system – fiat money and dinar – may pose problems if people

43 Peter L. Bernstein could write a 400 page book just on the history of gold!

kept pricing in fiat currency and then converting to dinar. At times arbitrage between fiat and dinar could become possible.

5. Confidence in the system need to be boosted particularly on the gold security and withdrawal issues.

REFERENCES

Bank Negara Malaysia Annual Report 2000.
Bernard Lietaer, The Future of Money, Century, 2001.
Bernstein, Peter L., The Power of Gold, John Wiley, 2000.
Brealy, Richard A. and Steward C. Myers, Principles of Corporate Finance, 4th ed., McGraw Hill, 1991.
Business Week, "Hot Money", March 20 1995.
Cargill, Thomas F., Money, The Financial System and Monetary Policy, Prentice Hall, 1979.
Choudhury, Masudul Alam., Money in Islam: a study in Islamic political economy, London: Routledge, 1997.
Chown, John F., A History of Money, Routledge, 1994.
Cribb, Joe (ed.), Money – From cowrie shell to credit cards, British Museum Publications, 1986.
El-Diwany, Tarek, The Problem With Interest, TA-HA Publishers, United Kingdom, 1997.
Dornbush, Rudiger and Stanley Fisher, Macroeconomics, 3rd ed., McGraw Hill, 1984.
Kean, Neoh Soon, Stock Market Investment in Malaysia and Singapore, Kuala Lumpur: Berita Publishing, 1986.
Klein, Money and the Economy, 4th ed., Harcourt Brace Jovanovich, 1978.
Lipsey, Richard G. and Peter O. Steiner, Economics, 4th ed., Harper and Row, 1978.
Macedo, Jorge Braga de, Barry Eichengreen and Jaime Reis (ed.), Currency Covertibility – The gold standard and beyond, Routledge, 1996.
Meera, Ahamed Kameel, The Islamic Gold Dinar, Pelanduk Publications, 2002.
Mishkin, Frederic S., The Economics of Money, Banking and Financial Markets, 6th edition, Addison Wesley, 2001.
Sherman, Eugene J., Gold Investment, Prentice Hall, 1986.
Vadillo, Umar I., The Return of the Gold Dinar: A Study of Money in Islamic Law, Madinah Press, 1996.

Web articles:

Dibbell, Julian, "In Gold We Trust", Wired, http://www.Wired.com/wired/archive/10.01/egold_pr.html Date accessed Feb. 21, 2002.
"The Islamic Dinar", http://www.murabitun.org/WITO/dinar.html Date accessed: October 18, 2001.
"The Case for Gold", http://www.the–privateer.com/gold.html Date accessed: December 4, 2001.
"What Caused the Asian Currency and Financial Crisis? Part II: The Policy Debate" Giancarlo Corsetti, Paolo Pesenti and Nouriel Roubini. September 1998. http://www.stern.nyu.edu/globalmacro/asiacri2.pdf.
"An Introduction to Open Economy Macroeconomics, Currency Crises and an Analysis of the Causes the Asian Crisis" by Nouriel Roubini http://www.stern.nyu.edu/~nroubini/NOTES/intromacro.html Date accessed: 20 January 1999.
"What Caused the Asian Currency and Financial Crisis? Part I : A Macroeconomic Overview" Nouriel Roubini, Giancarlo Corsetti and Paolo Pesenti. September 1998. http://www.stern.nyu.edu/globalmacro/AsianCrisis.pdf.
"Fundamental Determinants of the Asian Crisis: A Preliminary Assessment" Giancarlo Corsetti, Paolo Pesenti and Nouriel Roubini. November 1998. http://www.stern.nyu.edu/globalmacro/jimf06.pdf
"The Onset of the East Asian Financial Crisis" Steve Radelet and Jeffrey Sachs. March 1998. http://www2.cid.harvard.edu/hiidpapers/eaonset2.pdf
"What have we learned, so far, from the East Asian Financial Crisis?" Steven Radelet and Jeffrey Sachs. January 1999. http://www.hiid.harvard.edu/pub/other/aea122.pdf
"Bahtulism: Who poisoned Asia's Currency Markets?" Paul Krugman. Slate, August 1997. http://web.mit.edu/krugman/www/baht.html
"What Happened to Asia?" Paul Krugman (1/98) http://web.mit.edu/krugman/www/DISINTER.html

NOTES TO CONTRIBUTORS

The ECONOMIC BULLETIN and the Department of Economic Studies, Faculty of Business Management, Universiti Teknologi MARA, welcome contributors to submit researched articles on both conventional and Islamic economics for the Bulletin / Journal. The Bulletin provides the focus for both theoretical and applied work–emphasising on the realism on the realism of analysis, provision and use of empirical evidence and the formulation of economic policies, where relevant and plausible.

Preparation of the Manuscripts

1. Manuscripts must be type written in Microsoft Word (windows 3.1 and above). Please forward a copy of the manuscript and computer disk on IBM 3.5" format.
2. All copies must be type written in journal style on one side only, on A4 paper, in double spacing (including footnotes and references), with left hand margin 1.5".
3. The front page should include the title of the article, author(s) name and briefs and affiliation of the author(s).
4. Include an informative abstract of about 100 words with each copy of the article.
5. Tables and diagrams should be properly titled, with relevant notes cited.
6. All mathematical / statistical notations or formulae, when used, must be directly relevant to the articles with proper explanation given. Longer formulae etc. should placed in the appendix.
7. Contribution should not normally exceed 7,500 words in length.

Format of References in the Text

1. Use footnotes sparingly. Essential footnotes should be indicated by subscript figures in the text and appear in the same page as referenced.
2. Citation in the text – written in parentheses – the last name of the author, year of publication e.g. Friedman (1993), or Freidman and Freidman (1993) for special quotations, (Sweezy, 1980: 123). The Convention of, Jomo (1990 a), Jomo (1990b) should be used if more than one publication by the same author(s) in a particular year is cited.

List References or Bibliography

1. **Articles from journals**:
   Arnold, P.J., Hammond, T.D. and Oakes, L.S (1994). 'The contemporary discourse health care cost: conflicting meaningful conflict', Accounting, Auditing Journal, Vol. 7, No. 3, pp. 50-67.
2. **Books or monographs**:
   Bailey, K (1978), Methods of Social Research, The Free Press. New York: Oxford Press.
3. **Acts**:
   Fees Act 1951. (Revised 1973). Act 209, Laws of Malaysia
4. **Chapter from a book**:
   Doh, J.C. (1981). 'Budgeting as an instrument of development: The Malaysian Experiences', Comparative International Budgeting and Financial Transaction Books, New Brunswick, New Jersey.
5. **Government Publications**:
   Department of Statistics Malaysia (1991), Yearbook of Statistics, 1990, Kuala Lumpur.