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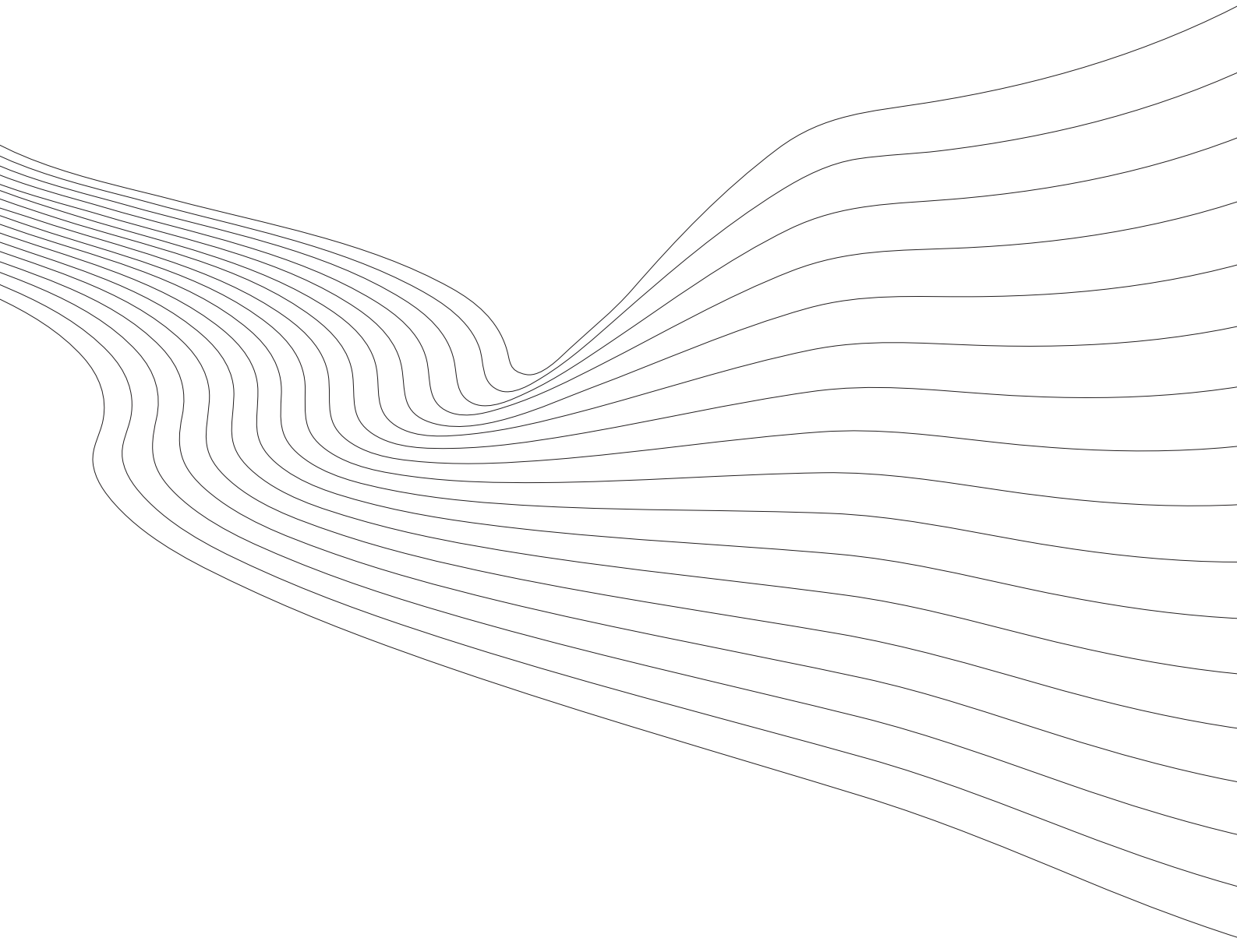

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Are Turkish migrants altruistic? Evidence from the macro data

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Abstract

We investigate in this paper whether the stable pattern of remittances over the last three decades can be explained by the altruistic behaviour. This possibility is tested by means of cointegration analysis, which is applied to Turkish remittances from Germany over the period 1962-2005. A single cointegrating relationship is found between the remittances of Turkish workers in Germany and the real Turkish GDP *per capita*, the real German GDP *per capita*, the stock of Turkish migrants in Germany, the real exchange rate, and the government instability. The negative coefficient associated with Turkish income and positive coefficients on the real exchange rate and political instability support the claim that Turkish remittances from Germany are altruistically motivated. In addition, we find that the coefficient on the stock of Turkish migrants to be equal to one.

Keywords: Migration; Remittances; Alturism; Cointegration

JEL classification: C22; F22; F24

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1 Introduction

Caring for the well-being of others has been a research topic in economics since Adam Smith (Smith (1759)). The most cited and influential work was done by Becker (1974), in which the welfare of others enters in utility functions. An altruist is willing to sacrifice own resources in order to improve the well-being of others. Altruism is a form of unconditional giving that might emerge from strongly feeling for others' feelings Gerard-Varet *et al.* (2000). However, the studies of determinants of private transfers in developed countries have generally rejected the pure altruism hypothesis, see Altonji *et al.* (1992, 1997). Likewise, most studies on the determinants of migrants' remittances rejected the pure altruism, Lucas and Stark (1985), despite of the Agarwal and Horowitz (2002)'s study. Agarwal and Horowitz (2002) based on micro data on Guyana find that per-migrant remittances are significantly and negatively related to the number of migrants from the same households. The support for the altruism motive in their study is rooted in the significance of this one variable. Altruism as a motive for remittances would have important economic consequences as altruism makes these flows stable. The Turkish nominal remittances underwent two stages in their development: first, they jumped up in the early 1960s and continued to grow steadily until the oil crisis of 1975 and then during the last 25 years they stabilized at the level of about 1 billion Euro per year, (see the top left of the panel in Figure 1). In this paper we aim at explaining the stability of remittances of Turkish workers' residing in Germany. The explanation we suggest is based upon the altruistic motive as the only motive compatible with such a pattern.

In this paper we develop a model of altruism, in which migrants remit because they care for those they left behind. The implications of the theory are tested using the macro data on Turkish remittances from Germany covering the period of 1962-2005. Our estimation results are consistent with the altruistic motive. It implies that the amount of remittances depends on the economic activity in the host country and on the migrants' attachment to their home country.

The paper is structured as follows. Section 2 discusses different motives to remit and the evidence from the literature on the determinants of remittances. Section 3 develops a model of altruism, which explains the determinants of foreign workers' remittances. Section 4 gives the empirical model. In section 5 the theoretical model is checked against the empirical evidence on the Turkish remittances from Germany over the 1962-2005 period. Section 6 concludes.

2 Literature Review

The literature on the determinants of remittances both at the micro and at the macro level finds that remittances are affected by a mixture of motives to remit rather than by a single motive. The most influential study among those taking advantage of the micro level data is Lucas and Stark (1985). It explains the workers' remittances to Botswana using a variety of hypotheses ranging from pure altruism to pure self-interest. As an intermediate hypothesis they use that of tempered altruism, or enlightened self-interest. According to this hypothesis, the remittances are part of a self-enforcing contractual arrangement between migrant and his family that are of a mutual benefit. The main conclusion of Lucas and Stark (1985) is that only the mixture of motives offers an appropriate explanation of the Botswana's evidence. At the macro level, Katseli and Glytsos (1989) modelled remittances as a portfolio allocation choice, where the migrant decides on the proportion of wealth to remit to his country for the investment purposes. In this setup, the interest rates in home country and host country, the expectations about future exchange rate movements, and the degree of the migrants' risk aversion are assumed to determine remittances. Empirical evidence on the significance of these variables is rather mixed, Glytsos and Katseli (1986), Glytsos (1988, 1997), see Table 1.

Further studies concentrating on portfolio allocations, as exemplified by El-Sakka and McNabb (1999), Faini (1994), Lianos (1997), Aydas *et al.* (2005), Alper and Neyapti (2006) and Shahbaz and Aamir (2009), show that both the exchange rate and interest rate differentials are important for attracting remittances. In some studies only the interest rates are significant Katseli and Glytsos (1989), Glytsos (1997), Abdel-Rahman (2003) and Vargas-Silva and Huang (2006). Yet other studies demonstrate the importance of the black market exchange rate or premium, Elbadawi and Rocha (1992), El-Sakka and McNabb (1999), Aydas *et al.* (2005) and Freund and Spatafora (2005). In addition, Higgins *et al.* (2004) find the real exchange rate volatility rather than the real exchange rate itself to be significant in explaining remittances.

In contrast, Swamy (1981) and Straubhaar (1986) find little or no evidence that the financial variables do affect the remittances. Based on the empirical results, Swamy (1981) claims that the share of female in migrant population is important, whereas Straubhaar (1986) argues that the political instability in the host country is a statistically significant determinant of the remittances.

In general, at the macro level, the variables representing all the motives to remit — such as altruistic, exchange, and investment (portfolio) motives — are included in a regression at once, which therefore represents the mixture of motives. As seen from Table 1, the following variables are found to be significant in the literature: the number of migrants in the host country, the economic activity in the host country and the home country, the length of stay in the host country, interest rate differentials, exchange rate, black market premia, inflation rate in the home country, the ratio of females to the total migrant population, the education level of migrant, and political risk factors in the home country. However, as it can be observed from Table 1, there is a little consensus on the key macroeconomic determinants of remittances. One common finding is that the stock of migrants is the primary determinant of remittances.

The host country income as measured by the host country GDP *per capita* is also found to be significant in some studies. Nevertheless, Higgins *et al.* (2004) and Vargas-Silva and Huang (2006) argue that the host country income should approximated by the unemployment rate and the money supply.

If the home country income has a negative sign, then it is considered as a support for the altruistic hypothesis. Alternatively, if the home country income has a positive sign, then it is interpreted as an evidence of the investment or exchange motive. See Table 1.

If the inflation rate takes a positive sign, then inflationary pressures in the home country reduce real income and thereby lead to an increase in remittances according to the investment motive. If, in contrast, the inflation rate has a negative sign, then it means that the high inflation undermines the economic and political stability and therefore leads to a reduction in remittances. Both effects are considered in the following papers: Glytsos (1988), Katseli and Glytsos (1989) Elbadawi and Rocha (1992), Faini (1994), Lianos (1997), El-Sakka and McNabb (1999), Abdel-Rahman (2003), Aydas *et al.* (2005), Alper and Neyapti (2006) and Shahbaz and Aamir (2009).

In a recent study Buch and Kuckulenz (2004) find that traditional variables such as economic growth, the level of economic development and proxies for the rate of return on financial assets are not significant in explaining remittances and argue that remittances might be

influenced by social considerations. In addition, other recent studies showed that some additional variables such as money transfer fees (Freund and Spatafora (2005)), the education level of migrants (Niimi and Özden (2006) and Shahbaz and Aamir (2009)), the income inequality, the availability of remittance services, and informal economy (Schiopu and Siegfried (2006)) can be important in determining remittances.

In this study, we will take another view and explore the determinants of Turkish workers' remittances from Germany within a context of altruistic motive. The hypothesis of altruistic motivation here is supported by our observation that the remittances in the recent years have been rather stable. This hypothesis is tested on the basis of the macro data.

3 Theoretical Model

The model in this section is closely related to Lucas and Stark (1985), Funkhouser (1995), and Stark (1995). We assume a separable utility function, according to which a migrant values his own utility, U_m and that of his family left behind in the home country, U_h:

$$U(U_m, U_h) = U_m(C_m) + V\{U_h(C_h), P\} \tag{1}$$

where C_m is the consumption of migrant; C_h is the consumption of his family in the home country; and P is the importance of the utility of the family left behind in the migrant's own utility, or the degree of migrant's attachment to home country. The utility function has the following properties: $U_m^{'} \succ 0$, $U_h^{'} \succ 0$, and $U_h^{''} \prec 0$, where U' denotes the first-order derivative of the utility function with respect to consumption and U'' denotes the second-order derivative.

The emigrant maximizes the separable lifetime utility function

$$\max_{R_t} U_m = \sum \frac{U_m\{C_m\}}{(1+\delta_u)^t} + \frac{V\{U_h(Y_{ht} + e_t R_t + N_{ht} e_t \overline{R}, P\}}{(1+\delta_v)^t} \tag{2}$$

subject to

$$C_{mt} = Y_{mt} - R_t \tag{3}$$

where C_{mt} is the consumption of the migrant at time *t*; Y_{mt} is the income of the migrant at time *t*; Y_{ht} is the income of the migrant's family in the home country; R_t is the nominal remittances expressed in the host country currency; e_t is the real exchange rate between the host and home country; $e_t \overline{R}_{ht}$ is the average remittances received from other migrant working in the host country and stemming from the same household; N_{ht} is the total number of migrants sent by this household to the host country (stock of migrants in the host country).

$\frac{1}{(1+\delta_u)^t}$ and $\frac{1}{(1+\delta_v)^t}$ are the discount rates applied to the migrant's own utility and to the utility of the migrant's family in the home country, respectively. The solution to the maximization problem is given by the reduced form equation for the determinants of remittances:

$$R_t = f(Y_{mt}, Y_{ht}, e_t, N_{ht}, P) \tag{4}$$

The model above has several testable implications, which are stated in Lucas and Stark (1985), Funkhouser (1995), and Rapoport and Docquier (2005):

1. Migrants with higher earnings remit more;
2. Low-income households receive more;
3. At the macro level, the more migrants the higher the total remittances.[1] At the micro level the relationship between the number of migrants stemming from the same family and amount of remittances can be either positive or negative.

We have two additional variables to test in this altruistic model:

4. Real exchange rate is expected to exert a positive impact on remittances;
5. Remittances increase with the degree of migrant's attachment to his family in the home country.

The positive relationship between the real exchange rate and remittances, given that the remittances are expressed in the home country's currency, is postulated in Faini (1994).

[1] In fact, following Swamy (1981), we expect the coefficient on the stock of migrants to be equal to one.

The measure of the migrant's attachment to his family left behind, *P*, can be related to the literature on transnationalism. Transnational migration represents immigrants that settle down and become well integrated in the host country but still maintain social, cultural, economic, and political ties with their home country, see Glick Schiller (1999) and Guarnizo (2003). In the literature on transnationalism, monetary remittances measure the strength of attachment the migrants feel towards their societies of origin. The main contribution of this paper is the empirical testing of the influence of the real exchange rate, migrant's attachment, and the stock of migrants on the remittances.

4 Empirical model

We model Turkish remittances from Germany as follows:

$$\ln\left(\frac{R_t}{Y_{ht}}\right) = \alpha_0 + \alpha_1 \ln pcY_{ht} + \alpha_2 \ln pcY_{ft} + \alpha_3 \ln S_t + \alpha_4 \ln e_t + P_t + \varepsilon_t \qquad (5)$$

In (5), $\ln\left(\frac{R_t}{Y_{ht}}\right)$ denotes the log of the share of nominal remittances of Turkish workers in Germany to the Turkish nominal GDP. The $\ln pcY_{ht}$ and $\ln pcY_{ht}$ are the log of the real Turkish GDP *per capita* and the log of the real German GDP *per capita*, respectively. We expect the sign of coefficient on home income to be negative if the Turkish workers are altruistic. The $\ln S_t$ is the log of the existing stock of Turkish migrants in Germany. $\ln e_t$ is the log of the real exchange rate. The exchange rate plays an important role in the portfolio, altruistic and exchange-related approaches. The portfolio approach suggests that the expectation of devaluation discourages remittances. Altruistic and exchange-related models predict that if the remittances are expressed in home country currency a real devaluation positively affects remittances. However, exchange-related models predict that the home country income would have a positive rather than a negative impact on remittances. Therefore, the negative sign on the home income together with a positive sign on real exchange rate supports the altruistic motive. P_t is the political instability, that is, the change in the government in Turkey, is added to the model to represent the degree of attachment to the home country. The corresponding dummy variable takes the value of 1, when there is government change in that year. We expect this variable to be significant and positive if the

Turkish migrants follow the altruistic motive.[2] Alternatively, if the estimated coefficient of political instability is negative, then it means that the investment motive is at work, as risky and unstable environment will discourage investments, see Ogbomienie Agbegha (2006).

The data on workers' remittances were obtained from the balance sheets of the Bundesbank, while the data on the per capita GDP of Germany and of Turkey were obtained from the World Market Monitor, and the Turkish Institute of Statistics, respectively. The stock of Turkish migrants is obtained from the Federal Statistical Office in Germany. The TL/euro exchange rate is obtained from the World Market Monitor. Data on government instability is constructed by Dr. Mehmet Asutay, Durham University.

5 The general to specific approach and econometrics results

Modelling based on the general-to-specific modeling approach that aims to build empirical models that economically sensible and statistically satisfactory, Hendry (1995), Campos and Ericsson (1999) and Hoover and Perez (1999). Although we have forty-two years of annual data, as shown in Akkoyunlu (1999) and Campos and Ericsson (1999), the sample size is only one of several factors which determine how much information is in the sample. Even our data sample is small, the data movements so large that are crucial for the information of data, see Figure 1. Therefore, over-parameterisation should not be a concern.

Therefore, we start with a general model which is probably over-parameterised with one lag for the log of the share of nominal remittances of Turkish workers in Germany to the Turkish nominal GDP, $\ln\left(\frac{R_t}{Y_{ht}}\right)$ and a set of explanatory variables (the log of the real *per capita* Turkish GDP, $\ln pcY_{ht}$, the log of the real *per capita* German, $\ln pcY_{ft}$, the log of the stock of Turkish migrants in Germany, $\ln S_t$, the log of the real exchange rate, $\ln e_t$, and the political instability, P_t). Thus, we allow for everything[3] at the outset that might be significant and then investigate whether and how this initial general model can be reduced without significant

[2] Likewise, Clarke and Wallsten (2003), based on evidence from Jamaica following hurricane Gilbert, find that remittances protect households against exogenous shocks. Yang (2006) also supports these findings. He studies the experience across the developing countries and figures out that in the poorer half of the sample, the hurricane exposure leads to substantial increases in migrants' remittances.

[3] We also tried including financial variables such as the home and host country interest rates and the home country inflation rates. However, all variables were insignificant, and further supported the altruistic motive.

loss of information about the parameters of interests. Economic theory information helps specify the vector of parameters of interest; however, the parameters of interest might come from a data-instigated model. However, theory consistency is essential, so that there is no evaluation conflict between the model and the theory interpretation. Hence, I aim to conclude with a parsimonious model which has orthogonal regressors as well as satisfying the necessary conditions for both congruence and encompassing.

However, the general-to-specific modelling *still* suffers from allegations that it mines the data pejoratively. These allegations are, as in Campos and Ericsson (1999):

I. *Repeated Testing:* Regressors are selected in an attempt to maximise *t*-ratios. Thus simply conducting multiple tests will induce significant outcomes by chance.

II. *Data Interdependence:* Non-constant coefficient might result due to an omitted regressor that is correlated with the included one, and this correlation changes over time due to regime changes that generate the system.

III. *Corroboration:* The regressors are chosen according to a criterion such as having sensible coefficient estimates. However, there might still be important omitted variables.

IV. *Over-parameterization:* If the model is over-fitted, it uses up many degrees of freedom.

However, this paper, during the building process of the empirical model, shows that these allegations can be refuted easily.

The annual data covers the period from 1962-2005 (see Figure 1, for the basic properties of the data).

Our first step is to obtain parsimonious unrestricted model. The results of the unrestricted general model are given in Table 2. Table 2 shows that the unrestricted model can adequately describe the data, since the misspecification tests show no serious departures from the underlying model assumptions.

The next step is to find the cointegrating relationship between variables. The solved long run equation, as well as the error correction mechanism (ECM) is given below. The test on the significance of the lag length suggests that the model should have one lag.

$$\ln\left(\frac{R_t}{Y_{ht}}\right) = 39.156 - 2.608 \ln pcY_{ht} - 4.046 \ln pcY_{ft} + 1.495 \ln S_t$$
$$(SE) \quad (3.595) \quad (0.521) \quad (0.765) \quad (0.094)$$
$$+ 0.448 \ln e_t + 0.127 P_t \qquad (6)$$
$$(SE) \quad (0.235) \quad (0.063)$$

$$ECM_t = \ln\left(\frac{R_t}{Y_{ht}}\right) - 39.156 + 2.608^* \ln pcY_{ht} + 4.046^* \ln pcY_{ft}$$
$$- 1.495^* \ln S_t - 0.448^* \ln e_t - 0.127^* P_t \qquad (7)$$

WALD test $\chi^2(5) = 623.279$ [0.00] **

Tests on the significance of each lag

Lag	
1	F(5,32) = 21.815 [0.00] **

It is immediately clear that this set cointegrates.[4] Thus, the residuals are innovations against the available information. The solved long run equation represents the cointegrating vector that enters in the conditional model as the error correction term.

In the long run equation, the real Turkish *per capita* GDP and the real German *capita* GDP contribute negatively to Turkish remittances from Germany, while the stock of Turkish migrants, the real exchange rates and the political instability contribute positively to Turkish remittances from Germany. The negative coefficient on the real Turkish *per capita* GDP is consistent with the altruistic theory. The stock of Turkish migrants enters with a unitary coefficient in the long-run equation. The long-run coefficient of the real exchange rate which is lower than one suggesting that a real depreciation leads to lower remittances in terms of foreign goods, see Faini (1994). However, in this study the dependent variable, remittances are expressed in home country currency (as a ratio to Turkish GDP). Therefore, the positive coefficient on the real exchange rate suggests that a 10 percent increase in the real exchange rates *increases* remittances by 4.48 percentage points- a significant effect.[5] The positive and

[4] The graphics, regression output and residual diagnostic tests were all calculated using GiveWin 2.2, Pc-Give 10.2 and Pc-Gets 1.2, see Doornik and Hendry (2001a,b,c).
[5] Shahbaz and Aamir (2009) also find a strong positive effect of real exchange rates on remittances to Pakistan for the period 1971-2006, but not a short-run effect is observed.

significant coefficient on the political instability suggests that migrants closely follow the developments and changes in the home country and react to these developments and changes.

The negative long-run coefficient on German GDP that we found in our estimations can be explained by an increase in income inequality that took place in the recent years in Germany, see Dustmann *et al.* (2006). The vast majority of Turkish workers are unskilled and therefore the growth rate of their income is very low (almost zero) and is certainly much lower than the overall economic growth in Germany. Hence the negative long-run relationship between remittances and German real GDP may reflect this sharp increase in income dispersion.

There are a few steps in the reduction of the final (conditional) model from the above general specification and these reductions are done automatically with Pc-Gets[6] (the corresponding standard errors and *t*-ratios reported in parentheses below the coefficient estimates).

$$\Delta \ln\left(\frac{R_t}{Y_{ht}}\right) = -0.033 - 1.346\ \Delta \ln pcY_{ht} + 2.083\ \Delta \ln pcY_{ft} + 1.131\ \Delta \ln S_t$$

$$\begin{array}{lllll} (\text{SE}) & (0.031) & (0.433) & (0.734) & (0.087) \\ [\text{t}] & [-1.07] & [-3.11] & [2.82] & [13.00] \end{array}$$

$$+ 1.022\ \Delta \ln e_t + 0.076\ P_t - 0.569\ ecm_{t-1} \qquad (8)$$

$$\begin{array}{lll} (\text{SE}) & (0.151) & (0.034)\quad (0.071) \\ [\text{t}] & [6.75] & [2.21]\quad [-8.06] \end{array}$$

$R^2 = 0.909$ $F(6,36) = 60.08$ [0.00] $\hat{\sigma} = 0.103$ DW = 1.77
RSS = 0.3849 for 7 variables and 43 observations
F_{ar} (2,34) = 0.448 [0.64] F_{arch} (1,34) = 2.134 [0.15]
χ^2_{nd} (2)= 0.32 [0.85] F_{hetero} (11,24) = 0.22 [0.99]
F_{reset} (1,35) = 0.36 [0.55] T = 43 (1963-2005)

The conditional model (equation (8)) is parsiomonious. The diagnostic tests are satisfactory; hence, the conditional model satisfies the *design criteria.* The data generating process (DGP) as a model satisfies the design criteria suggesting that the general-to-specific modelling is successful in creating a model that mimics the properties of DGP. The error-correction term is highly significant and has the expected sign. Figure 2 shows the actual and fitted values of the final model. The graphs show how well the final model explains the data and the residuals uncorrelated and normally distributed.

[6] The corresponding standard errors and t-ratios are reported in parentheses below the coefficient estimates.

The short-run impact of the German GDP on remittances is positive and the sum of coefficients on the home and host countries' income is equal to one which is consistent with the altruistic theory. The altruistic theory implies that an increase in the migrant's income by one euro, coupled with one-euro drop in the income of the migrant's family left behind, raises the amount transferred exactly by one euro. The unit coefficient on the stock of Turkish migrants is also confirmed by the econometric analysis. The negative coefficient on Turkish income with a positive coefficient on the real exchange rate further supports the altruistic theory. The coefficient on the real exchange rate that is larger than one indicates that real depreciation leads to higher remittances even when the remittances are expressed in terms of the host country's good, see Faini (1994). Furthermore, consistent with logic of transnational migration theory, the positive long-run as well as short-run impact of political instability suggests that Turkish migrants are altruistic. Thus, Turkish migrant responds positively to political and economic changes in the home country.

Figures 3, 4 and 5 plot the recursive estimates for the coefficients on the constant term, $\Delta \ln Y_{ht}$, $\Delta \ln Y_{ft}$, $\Delta \ln S_t$, $\Delta \ln e_t$, P_t, and ecm_{t-1}; their respective *t*-ratios; and the recursive residual sum of squares, one-step residuals, one-step Chow statistics, and break–point Chow statistics, respectively. Constant coefficients in Figure 3 in the presence of the large variations in the marginal process such as incomes and exchange rates imply super exogenous variables that counter the second sense of data mining. Further, the recursive *t*-ratios in Figure 4, increase in absolute value as the sample size increases countering the first sense of data mining. Hence, the nominal critical levels of test statistics are not affected. Even with forty-three observations and seven variables in the final model *t*-ratios are greater than three in magnitude suggesting that over-parameterisation is not a concern given information content in the data and refuting the fourth sense of data mining. Figure 5 shows that the recursive residual sum of squares increase over time and the recursive estimate of standard error $\hat{\sigma}_t$ declines over time rather than increase, hence countering the first sense of data mining. Furthermore, insignificant one-step and break-point Chow statistics support this refutation. Finally, the conditional model is able to accurately forecast Turkish remittances from Germany over the 2000-2005 period (see Figure 6 for the one-step ahead forecasts) and this aspect is supported by the forecast test ($\chi^2_{forecast}$ (6) = 2.89 (0.82)) , Kiviet (1986) and the

parameter constancy test over *k th* periods (F_{Chow} = 0.27 (0.94)), Chow (1960). The forecast results refute the first and second sense of data mining.

5 Summary

In this paper we develop an altruistic model of migrants' remittances to their home country and test this model using the 1962-2005 annual data and the cointegration technique on the remittances of Turkish workers staying in Germany. A single cointegrating vector is found among the remittances and the following variables: the home country income, the host country income, the stock of migrants, the real exchange rate and the political instability.

Based on the results of the cointegration analysis, a parsimonious single equation conditional error-correction model is developed. That is both congruent and parsimoniously encompasses the general model. The residuals are also innovations against the available information. The results further support the view that a constructive data mining *qua* general-to-specific modelling approach is productive as it has a high probability of locating the DGP.

The host country's income has a positive effect upon remittances in the short run, whereas the home country's income exerts a negative effect on remittances both in the short and long run. The unit coefficient on the stock of Turkish migrants is also confirmed by the data. Additionally, we found a positive impact from the real exchange rate and the political instability. The positive impact of the real exchange rate on remittances are especially important for the design of adjustment programmes that mainly aim at shifting resources toward the traded goods sectors by real exchange rate depreciation should also consider its impact on remittances.

Turkish migrants in Germany seem to be very sensitive to the economic and political situation in Turkey, since when there is a real devaluation and/or political instability they immediately react by sending more remittances. The results of our estimation support the altruistic model but are also consistent with the literature on transnationalism and offer interesting insights, because they allow explaining the recent trends in Turkish remittances from Germany. Thus, as long as Turkish migrants have altruistic motive and engage themselves in transnational activity, they will continue supporting the welfare of their home country and will maintain the remittances stable.

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Table 1: The literature on determinants of remittances

Paper	Host countries	Home countries	Sample	Dependent variable	Regressors (sign)	Estimation method
Swamy (1981)	Germany	Yugoslavia, Turkey & Greece	1962-1979	Remittances & remittances per migrant worker	Number of workers (+); host country income (+), ratio of females in migrant population (--)	Panel data estimation
Straubhaar (1986)	Germany	Turkey	1963-1982	Change in real remittances	Relative change in real wages in Germany (+); relative change in employment in Germany (+) and dummy variable for frequent change in government in Turkey (--)	Time series estimation
Glytsos (1988)	Germany	Greece	1960-1982	Remittance per migrant	Remittances from Germany: per capita income in the host country expressed in home country's currency (+); inflation rate (--); exchange rate (--); time (+). Remittances from USA: per capita income in the host country (+); per capita income in the home country (--); two year lagged dependent variable (+); inflation rate (+); time (--).	Time series estimation
Katseli and Glytsos (1989)	Germany	Greece	1961-1982	Remittances per migrant	Income per capita in the host country (+); income per capita in Greece (+); interest rates in Germany (--); inflation rate (--); ratio of consumption of durables to total	Time series estimation

					durables (--).	
Elbadawi and Rocha (1992)	Total	Algeria, Morocco, Portugal, Tunusia, Turkey & Yugoslavia	1977-1989	Real remittances, real remittances per migrant worker & real remittances per migrant	Host country income (+); length of stay (--); inflation (--); black market premium (--)	Panel data estimation
Faini (1994)	Total	Morocco, Portugal, Tunisia, Turkey & Yugoslavia	1977-1989	Real remittances in home country currency	Stock of migrant population (+); host country income (+); home country income (--); real exchange rate (+); expected devaluation adjusted interest rates differentials between the host and home country (+); time (--); inflation (--)	Seemingly unrelated regression
Glytsos (1997)	Germany and Australia	Greece	1960-1993	Remittances per migrant in drachmas	Remittances from Germany: per capita income in the host country (+); per capita income in the home country (--). Remittances from Australia: per capita income in host country (+); per capita income in home country (--); number of Greek migrants (--); interest rates in the host country (--).	Time series estimation

Lianos (1997)	Germany, Belgium and Sweeden	Greece	1961-1991	Remittances	GDP per capita in the host country (+); industrial hour wages in host country (+); Greek migrant population in host country (+); exchange rate (--); host country real interest rates (--); home country real interest rates (+); inflation rate in Greece (+); unemployment rate in host country (--).	Time series estimation
ElSakka and McNabb (1999)	Total	Egypt	1967-1991	Remittances	Real per capita income in the host country (+); inflation rate (+); real domestic interest rates to host country interest rate (+); difference between the official and black market exchange rates (--).	Time series estimation

Abdel-Rahman (2003)	The Kingdom of Saudi Arabia	Bangladesh, Egypt, India, Pakistan & Philippines	1975-2001	Change in remittances per worker	Long run: GDP per capita in the host country (+); wage rate in the host country (+); nominal and real interest host country (--) or ratios of host country to home country interest rates (--); differential parity condition in host relative to home country (-); degree of government stability and the law & order indicators (--); composite socio-political stability indicator (--). Short run: change in host country GDP (+); change in host country per capita GDP (+); change in host country wage rate (+); change in inflation (+); change in differential parity condition (--); change in composite soci-political stability indicator (--); the long run solution (--).	Time series estimation
Buch and Kuckulenz (2004)	Total	87 developing countries	1970-2000	Remittances over GDP and remittances per migrant	GDP per capita in home country (--); share of female in labour force (--); dependency ratio (--); illiteracy (+).	Panel data estimation

Higgins *et al.* (2004)	US	9 Latin American countries	1970-1997	Remittances per migrant	The real home country income per capita (+); the unemployment rate in USA (-) and uncertainty in real exchange rates (--).	The fixed effects IV and non-IV technique
Aydas *et al.* (2005)	Total	Turkey	1965-1993	Change in remittances & change in remittances per migrant	Host country GDP per capita (+); home country GDP per capita (--); real Turkish GDP growth (+); change in black market premium (--); inflation rate (--); change in real overvaluation (--); change in exchange rate depreciation adjusted interest rate differentials (+); dummy for military interventions (--).	Time series estimation
Freund and Spatafora (2005)	Total	104 countries	1995-2003	Remittances, remittances per migrant & remittances per capita	Stock of migrant workers (+); service fee (--); unofficial exchange rate (--).	Panel data estimation
Gupta (2005)	US	India	1975-2002	Changes in real remittances	Percent change in non-agricultural employment in the US (+); dummy for drought years (+); change in LIBOR (+); dummy for Asian crisis (--).	Panel data estimation

Niimi and Özden (2006)	Total	85 Countries	2000	Remittances, remittances over GDP & remittances per migrant	Stock of migrants (+); bank deposits over GDP (+), bank credits over GDP (+); home country GDP (+); home country GDP per capita (--); indicator of tertiary education among migrants (--).	Cross-section
VargasSilva and Huang (2006)	US	Mexico	Quarterly data: 1981:1-2004:4	Nominal remittances	US Federal Fund rate (+); US money supply (+); US consumer price index (+); US unemployment rate (+).	VECM
Alper and Neyapti (2006)	Total	Turkey	Monthly Data: 1991:1-2003:12	Nominal remittances	Long run: 1-year Turkish lira depost rate (+); consumer price index (--); exchange rate (+); long-run home country's manufacturing production (+). Short run: change in manufacturing production index (--); inflation (+); change in exchange rate (--); change in 1-year Turkish lira deposit rate (--).	VECM
Ogbomienie Agbegha (2006)	Total	Latin America, Caribbean & Sub-Saharan Africa	1970-2003	Remittances per capita	The host country GDP per capita (+); home country GDP per capita (--); political stability (--).	Panel data estimation

Schiopu and Siegfried (2006)	21 West Europe countries	Algeria, Egypt, Morocco, Tunisia, Croatia, FYR of Macedonia, Serbia and Montenegro, Romania & Russia	2000-2005	Remittances per migrant	Income differentials between the host and the home countries (+); fraction of unskilled people in total stock of migrants (--); fraction of low and medium skilled people in total stock of migrants (--); income inequality (+); availability of remittance services in both sending and receiving countries (+); informal economy (--).	Panel data estimation
Schahbaz and Aamir (2009)	Total	Pakistan	1971-2006	Remittances as share of GDP and Remittances per capita	Manufacturing production index (--); world GDP (+); annual inflation rate (+); real effective exchange rate (+); world real interest (--); secondary school enrolment (--).	Time series estimation

Table 2: Least squares estimates of the unrestricted altruistic model, $\ln\left(\frac{R_t}{Y_{ht}}\right)$ (Equation 5):

Lag j	0		1	
Variables		[t]		[t]
Constant	22.2790			
	(3.306)	[6.74]		
$\ln\left(\frac{R}{Y_h}\right)_{t-j}$	_____		0.431	
			(0.082)	[5.27]
$\ln pcY_{ht-j}$	-1.122		-0.362	
	(0.479)	[-2.34]	(0.549)	[-0.66]
$\ln pcY_{ft-j}$	2.334		-4.636	
	(0.862)	[2.71]	(0.840)	[-5.52]
$\ln S_{t-j}$	1.445		-0.294	
	(0.161)	[7.12]	(0.177)	[-1.66]
$\ln e_{t-j}$	1.085		-0.829	
	(0.170)	[6.38]	(0.187)	[-4.43]
P_{t-j}	0.072		_____	
	(0.038)	[1.89]		

R^2 = 0.986 F(10,32) = 225.1 [0.00]** $\hat{\sigma}$ = 0.106 DW = 1.86
RSS = 0.3631 for 11 variables and 43 observations
F_{ar} (2,30) = 0.55 [0.58] F_{arch} (1,30) = 1.44 [0.24]
χ^2_{nd} (2) = 0.19 [0.91] F_{reset} (1, 31) = 5.13 [0.03] T = 43 (1963-2005)

R^2 is the squared multiple correlation, $\hat{\sigma}$ is the residual standard deviation. The diagnostic tests are the form $F_j(k,T-1)$ which denotes an approximate *F*-test against the alternative hypothesis *j* for: k^{th} -order serial correlation F_{ar}, Goldfrey (1978), k^{th} -order autoregressive conditional heteroscedasticity F_{arch}, Engle (1982), heteroscedasticity F_{hetero}, White (1980), the functional form RESET test F_{reset}, Ramsey (1969) and a chi-square test for normality χ^2_{nd} (2), Doornik and Hansen (1994).

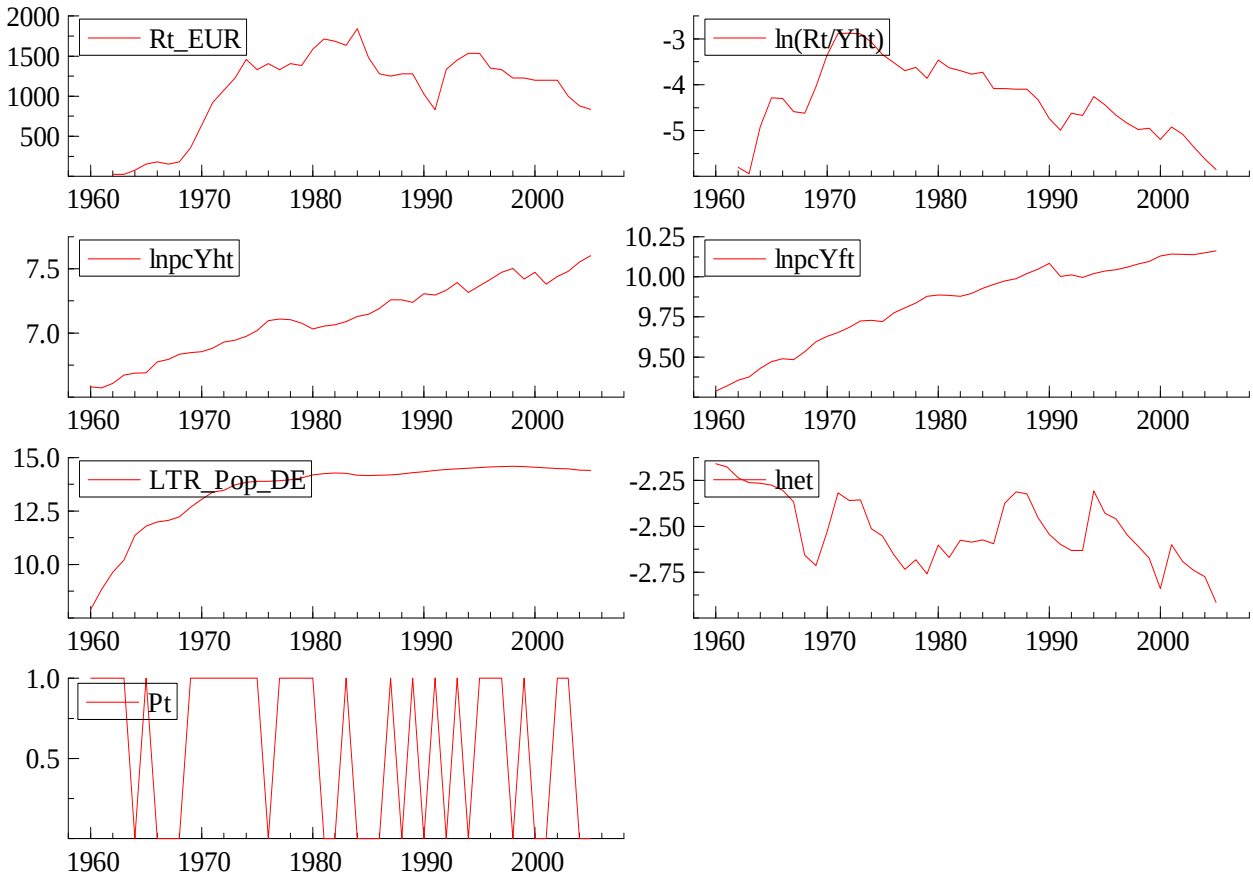

Figure 1: The basic properties of data: 1960-2004

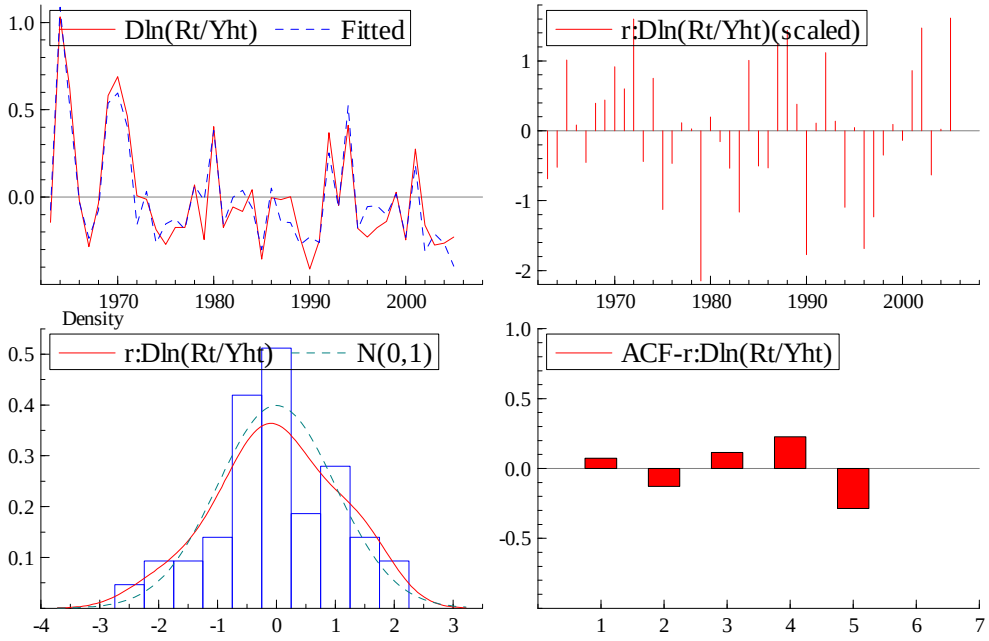

Figure 2: Actual and fitted values of migration model from Equation (8), residuals, the histogram and estimated density of the residuals and their correlogram

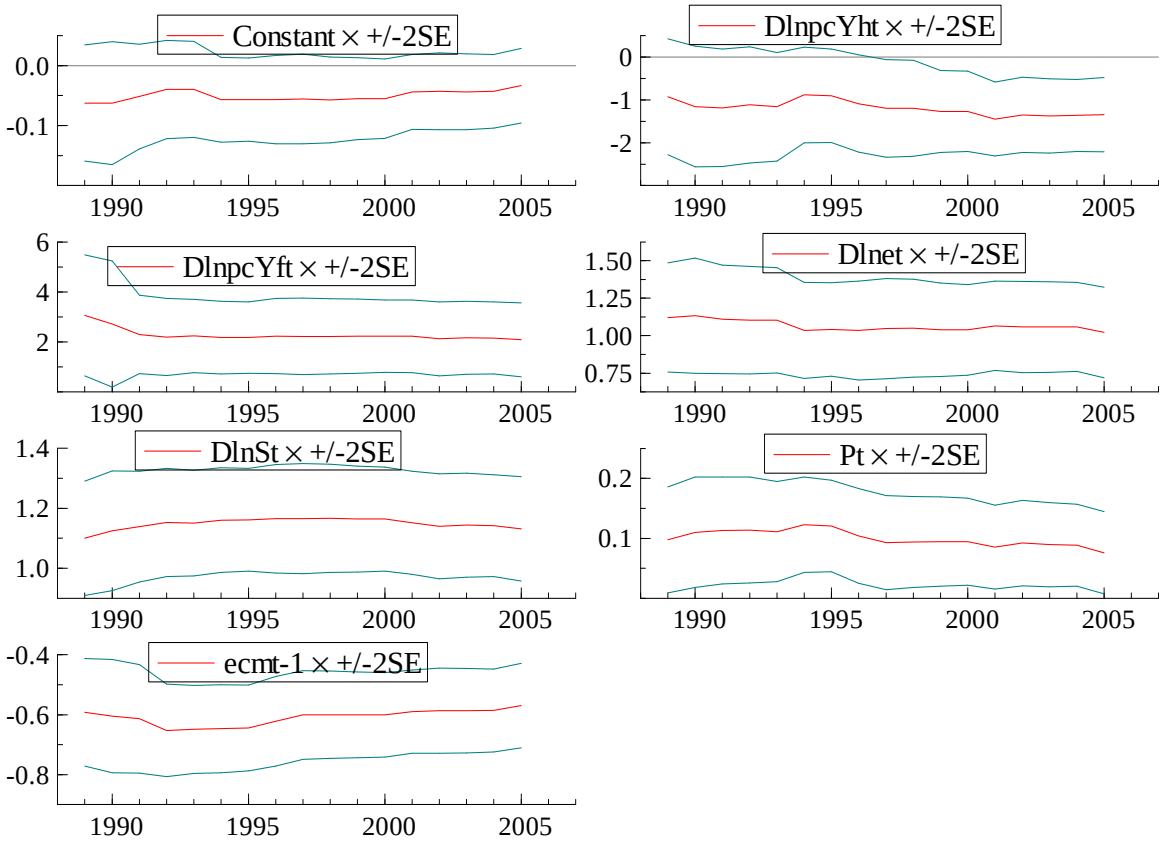

Figure 3: Recursive coefficients of consumption model (Equation 8) with ± SE

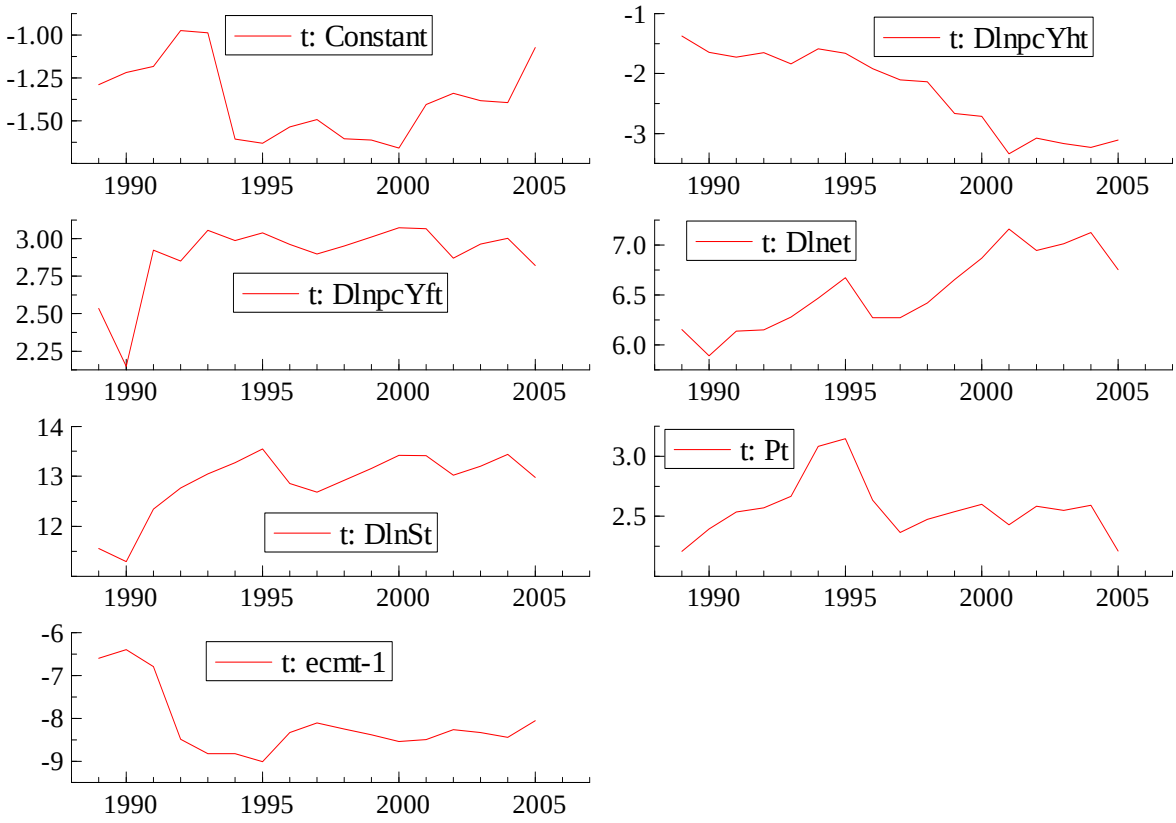

Figure 4: The recursive *t*-ratios

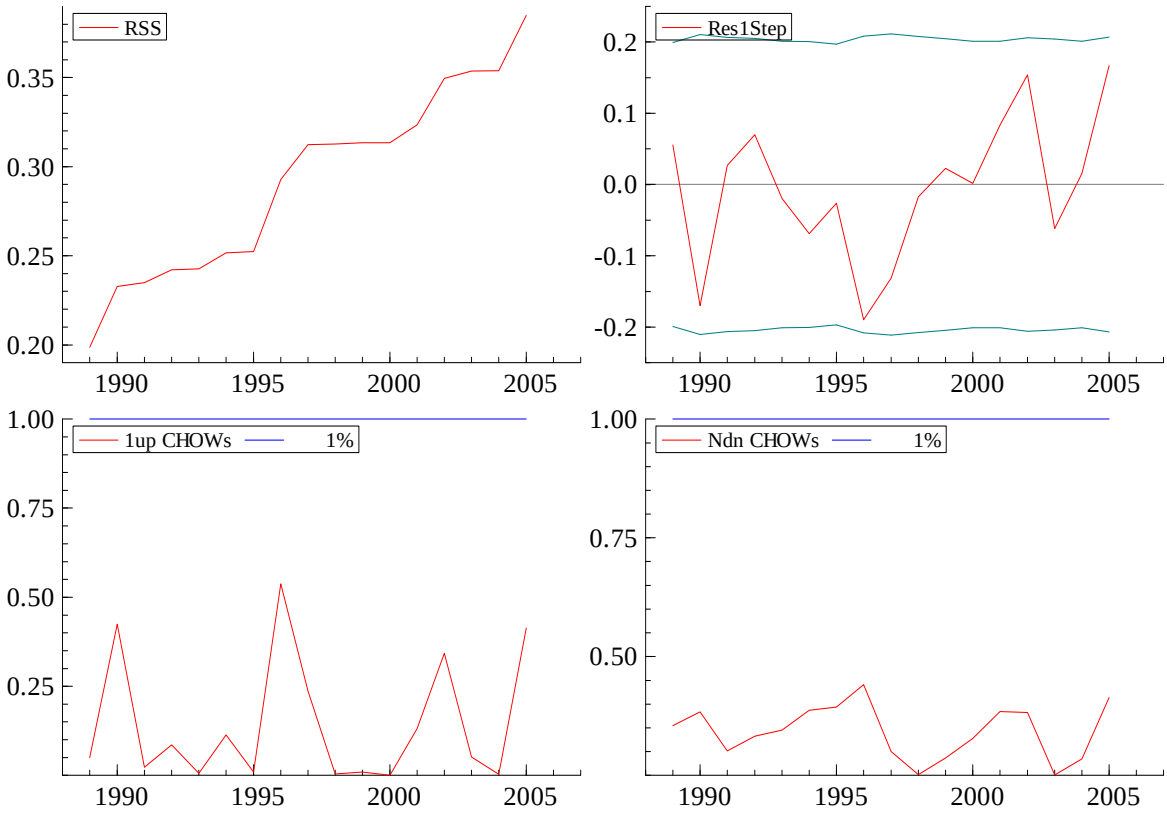

Figure 5: The residual sum of squares (RSS), one-step residuals and $0 \pm 2\hat{\sigma}_t$, one-step Chow statistics and breakpoint Chow statistics

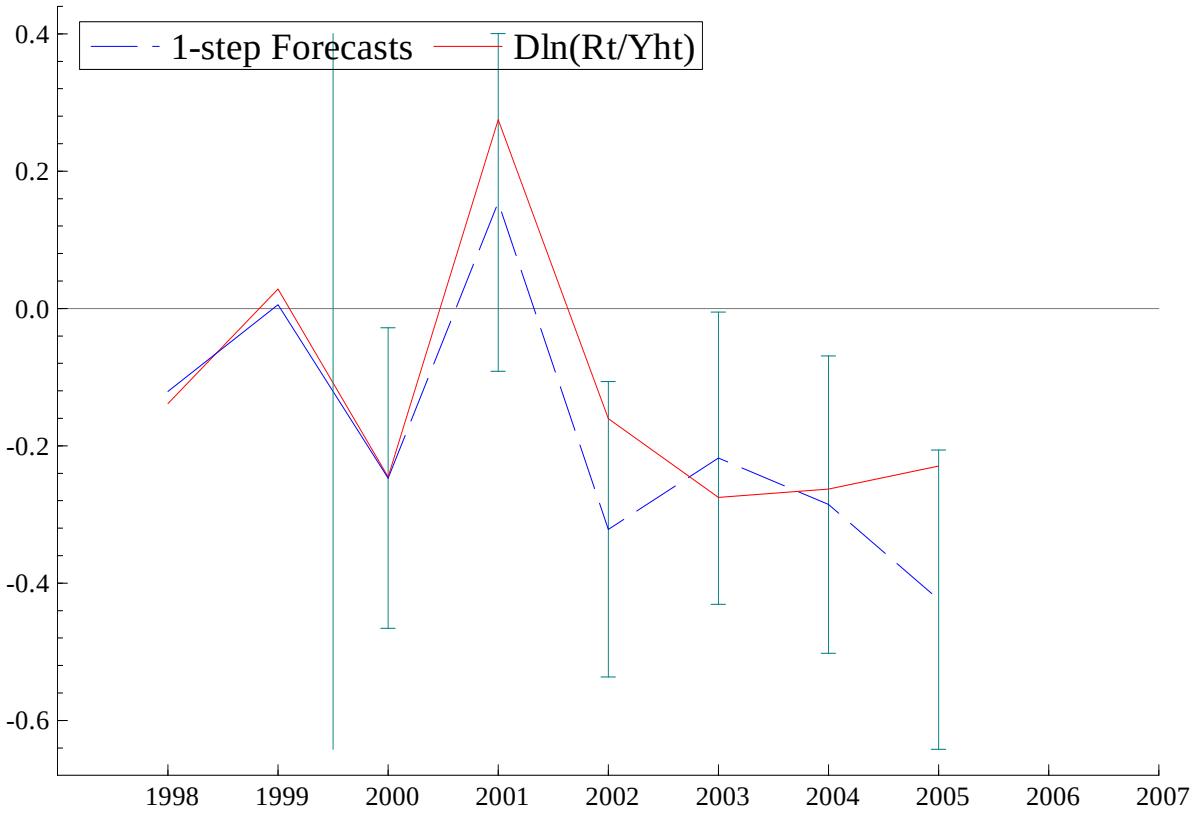

Figure 6: 1-step (ex-post) forecasts (dashed) for conditional model (8)