Mitigating Turkey's trilemma trade-offs

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Abstract

We study the trilemma configuration of the Turkish economy for the period between 2002 and 2012. The paper starts by empirically testing the Mundell-Fleming theoretical concept of an "impossible trinity" (trilemma) for Turkey, following Aizenman, Chinn and Ito (ACI, 2008). This includes calculating the trilemma indices and regressing them on a constant. We show that there is a misspecification with ACI approach and improve the specification by applying a Kalman filter to the classical linear regression that enables us to capture the time-varying importance of policy decisions within the trilemma framework. By comparing the residuals of each approach, we show that Kalman filter analysis has superior results. Then, our analysis continues by revealing a role for central bank foreign reserves and required reserves in mitigating the trilemma tradeoffs – we show that foreign reserves to GDP ratio and required reserve ratio have positive significant impact on the residuals obtained from the trilemma regression, thus making the policy tradeoffs smaller.

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1 Introduction

The macroeconomic policy "trilemma" for open economies, also known as the impossible trinity, implies that a country simultaneously can choose at most two of the following three goals: monetary independence (MI), exchange rate stability (ERS) and capital account openness (KO). The trilemma policy tradeoffs are conveniently represented via a triangle in Figure 1, where each corner represents full attainment of one of the three goals. Therefore, as shown, being at any vertex of the triangle represents attainment of the two goals at the adjacent corners, at the expense of abandonment of the third. However, partial attainment of all three policy goals has seemed to characterize the general framework of policymaking, especially for emerging market economies. This is a natural consequence as all three goals are potentially desirable and policy makers might attempt to meet all three partially. This is captured in the figure as being at a point somewhere in the interior of the triangle.

There have been works in the literature on achieving all three goals to some extent, based on observations derived from real world policy applications. Obstfeld and Taylor (1998) coins the term as "open-economy trilemma" and Obstfeld (1998) strongly asserts that policymakers will have to face this tradeoff even more fiercely with the global capital market integration speeding up further. However, Obstfeld, Shambaugh and Taylor (2004) reinterpret the constraints of the trilemma as they are mostly driven by historical applications rather than the necessary theoretical implications of the Mundell-Fleming model. Calvo and Reinhart (2001 and 2002) argue that under the free float there could be limited monetary autonomy while Bordo and Flandreau (2003) show that even under the classical gold standard domestic monetary autonomy is considerable. Bénassy-Quéré and Cœuré (2002) show empirically that the optimal exchange rate policy is not necessarily the hard peg or free float but somewhere in between, in which the exact location depends on country structural characteristics and government preferences.

Aizenman, Chinn and Ito (2008 and 2010), on the other hand, develop a new methodology to empirically characterize tradeoffs in practical policymaking. In their approach, ACI initially measure each policy dimension via an empirical index. The theoretical constraint of tradeoffs between the three policy goals is then captured by the coefficients in a regression where a constant is regressed on the trilemma indices. In our study, we attempt to improve the ACI approach by allowing the regression coefficients to change over time due to a possible misspecification problem with the OLS, specifically arising from the linearity assumption and/or forcing the residual

terms to round out to a constant. We calculate "how much of" each policy choice Turkey has actually implemented relatively in years between 2002 and 2012, using the estimated coefficients from our approach with the Kalman filter. Then, we focus our analysis on dimensions that mitigate the rigid impossible trinity hypothesis: we find foreign reserves to GDP ratio and required reserves to total banking sector deposits ratio to play significant role in giving a breathing room for the policy-makers in juggling all three policies at the same time.

The paper proceeds as follows: Section II gives a brief description of Turkish macroeconomic policies during the years of analysis. Section III describes the dataset used in this study. Section IV and V conduct the econometric analysis, report the results on the trilemma-influenced policy configuration over the period analyzed, and section VI concludes.

2 Trilemma in Turkish Context: From 1980s to Today

With the recognition of full convertibility of the Turkish Lira in 1989, Turkey fully liberalized its capital account and began to face the trilemma tradeoffs during the 90s. During this period, up until the crisis of 2001, pegged exchange rate regime was implemented with the aim of achieving price stability. However, this crisis was an important turning point for the Turkish economy as it made clear that such a regime was impossible to carry out due to the loss of confidence of economic agents at the time. Hence, on 22nd February of 2001, the Turkish Lira was allowed to float freely in order to prevent further damage to the economy. Through implementing a floating exchange rate in 2001 and announcing an inflation targeting regime (IT) in 2002, the Central Bank of the Republic of Turkey (CBRT) gained a more active role in achieving price stability with a more independent monetary policy. However, as the recent global crisis period suggests, price stability does not ensure financial stability by itself. During volatile periods with sudden shifts in risk perception, the CBRT responds to fluctuations in the currency, that are detached from the fundamentals, with the monetary and macroprudential measures in its toolbox in the face of free capital inflows and outflows. Therefore, it is not far-fetched to believe that the CBRT faces the traditional trilemma problem of maintaining a relatively stable exchange rate with an independent monetary policy in a globally integrated financial system.

3 Data

Our approach of constructing the trilemma indices mainly follows ACI approach with some departures. We initially construct indices for each of the three policy objectives of the trilemma: monetary independence, exchange rate stability and capital openness. But instead of using a cross-country sample with time-averages of annual data as in ACI, we use data for a single country, Turkey. Also, we use a different measure of capital account openness which is dictated by the needs of a time series analysis of trilemma policy stances.

The data we employ, being monthly, is higher in frequency than employed by ACI, and subject to substantial time variation. For composing the trilemma indices, we obtain quarterly data on GDP and monthly data on exchange rate and capital flows from the CBRT website. Quarterly GDP figures are then extrapolated to monthly figures using Fernandez (1981) method. Effective overnight rates are collected from Istanbul Stock Exchange (ISE) and Federal Reserve Bank of St. Louis website. To examine the impact of foreign reserves and required reserves on the flexibility of the trilemma configuration in Turkey, we use monthly averages of the CBRT weekly foreign reserves, required reserves and total banking sector deposits collected from the CBRT website.

Trilemma indices are constructed as follows:

Exchange Rate Stability (ERS) Index

Using the monthly standard deviations of the daily change in the log of the Turkish Lira-US dollar exchange rate, the index is constructed according to the formula below:

$$ERS = \frac{0.01}{0.01 + stdev(\Delta(log(exch\_rate)))} \tag{1}$$

The scaling ensures that the index lies between 0 and 1, with the highest value indicating the greatest degree of exchange rate stability. In the calculation of this index, we depart from ACI (2008) by employing daily series instead of monthly. The evolution of this index for the sample period is shown in Figure 2.

Monetary Independence (MI) Index

We follow ACI (2008) in measuring MI as the reciprocal of the correlation of interest rates between Turkey and the base country (US). Monthly correlations of overnight

rates are used as opposed to the yearly correlations of monthly rates used in ACI (2008). The index is constructed as:

$$MI = 1 - \frac{corr(i_{US}, i_{TR}) - (-1)}{1 - (-1)} \tag{2}$$

in which it lies between 0 and 1, with the highest value indicating the greatest degree of monetary independence. The plot of the MI index is shown in Figure 2.

Capital Openness (KO) Index

For construction of the KO index, we differ from the ACI approach of employing a de jure control. Instead, we use a simple de facto measure of capital account openness, following Hutchison et al. (2010), which is the ratio of the absolute sum of inward and outward capital flows[1] to GDP. A critical point should be noted that the KO index is not theoretically constrained to lie between 0 and 1, even though this was not violated during the period analyzed.

The lack of data with sufficient frequency on de jure controls dictates our approach. This can also be justified by the fact that de facto capital openness is not only driven by de jure restrictions on capital flows but also those on current account transactions as well as export proceeds and exchange rates. Furthermore, a country with capital controls might still be financially more open than a country without capital controls as private sector can circumvent such controls in most cases. Carvalho and Garcia (2006) show that attempts to deter inflows with capital controls were only effective for a brief period (no longer than six months) as firms adjust to the measures and find ways around them over time. KO Index plot is drawn in Figure 2.

4 Methodology

4.1 ACI Approach and Specification Error

Following ACI (2008), we initially test the validity of the trilemma assuming a linear relation among the policy choices. This reduces to examining the goodness of fit of this linear regression[2]:

[1] Foreign direct investment and portfolio flows.

[2] For this regression, we detect heteroskedasticity and autocorrelation in our robustness checks in several cases, even though the significance of our coefficients is affected only in a limited manner. Hence, we employ Newey-West standard errors in our regressions in order to be more precise and consistent in the presence of both heteroskedasticity and autocorrelation. The constant term on the left hand side of the regression is set equal to 2, since policy configurations on the corners of

$$2 = aMI_t + bERS_t + cKO_t + \epsilon_t \quad (3)$$

The contributions obtained from equation 3 are reported in Table 1A. The overall fit is extremely good, reflected in the very high R^2 numbers. However, as Ramsey and Alexander (1984) show, there might be specification errors in an equation which nonetheless gives satisfactory values for traditional test criteria. Applying Ramsey Regression Equation Specification Error Test to OLS results indicate that there is a specification error in the linear model outlined above (Table 1B). Possible explanations for such misspecification are the linearity inherent in the OLS analysis and an endogeneity between the regressors and the residual terms, which might arise from measurement errors or an omitted variable. To overcome this problem, we run a horse race among different specifications including two stage least squares with the first lags of the trilemma indices being the instrumental variables, an enhanced least squares estimation with the squared trilemma indices being added to the specification and a time-varying parameter specification in the Kalman fashion. We find that Kalman filter approach yields residuals with the smallest mean square and better normal distribution properties than the other specifications.

4.2 The Kalman Filter Approach

The Kalman filter is simply a term used to describe an algorithm that allows recursive estimation of unobserved, time varying parameters or variables in the system. Nevertheless, the Kalman filter is different from forecasting in that forecasts are made for the future, whereas filtering obtains estimates of unobservables for the same time period. The basic idea behind this filter is to arrive at a conditional density function of the unobservables using Bayes' Theorem together with the functional form of its relationship with the observables and an equation of motion. The filter uses the current observation to predict the next period's value of unobservable and then uses the realization of the next period to update that forecast. The Kalman filter is optimal, i.e. Minimum Mean Squared Error estimator, if the observed variable and the noise are jointly Gaussian.

Accordingly, both the Kalman filter and OLS can be described as optimal procedures in that they are theoretically capable of providing minimum variance unbiased estimators of the unknown coefficients of the classical linear regression model. In

the trilemma triangle would correspond to two corners being equal to 1 and the third corner to zero. Of course, this is just a normalization, i.e. using 1 on the left hand side would simply halve the estimated coefficients.

practice, however, because certain underlying assumptions of OLS are often violated, optimality is not guaranteed. Thus, the Kalman filter can always provide optimal estimates whenever OLS does and is also capable of doing so even when OLS does not. For instance, Watson (1983) discusses that Kalman filter is flexible enough to deal with the problem of multicollinearity in a way that OLS cannot. Within this context, the Kalman filter applied to the classical linear regression model can be considered as a generalization of OLS approach. Therefore, by implementing Kalman filter into the trilemma configuration, we take ACI approach into a more general and flexible framework in which OLS remains as a particular case in the analysis. With such set up, we attempt to fix the specification problem arising from the linearity assumption of the OLS estimation.

To perform the Kalman filter, we specify a state-space model in which the transition equation shows how the unobserved variables evolve and the measurement equation shows the evolution of the observed variables as a function of the unobserved variables. Accordingly, we adapt the described methodology into our trilemma framework by treating the parameters of the trilemma indices as unobserved and allowing them to vary over time. Measurement and transition equations are as follows;

Measurement equation:

$$2 = C(1)_t \cdot MI_t + C(2)_t \cdot ERS_t + C(3)_t \cdot KO_t + \delta_t \tag{4}$$

Transition equations:

$$\begin{aligned} C(1)_t &= \rho_1 C(1)_{t-1} + v_t \\ C(2)_t &= \rho_2 C(2)_{t-1} + \nu_t \\ C(3)_t &= \rho_3 C(3)_{t-1} + \epsilon_t \end{aligned} \tag{5}$$

where δ, v, ν and ϵ are assumed to be drawn from zero mean and normal distribution.

4.3 Comparison of ACI and Kalman Filter Approach

Our analysis show that the Kalman filter has superiority over OLS. Figure 3 displays the residual terms obtained both from the ACI and Kalman filter approaches whereas Table 2B display the descriptive statistics of these residuals. As expected, residuals

obtained from Kalman filter approach are smaller than the residuals obtained from ACI approach. Therefore, we focus on the residuals obtained from the Kalman filter approach in the next section.

5 Mitigating Trilemma Tradeoffs

In this section, we first assess the role of foreign reserves and required reserves in mitigating the trilemma tradeoffs in Turkish context, and then present a simple story of how they could work together in a small open economy in the face of volatile foreign capital flows.

5.1 Role of Foreign Reserves

In the aftermath of the East Asian crises, foreign reserves have increased dramatically in the emerging market economies despite the proliferation of greater exchange rate flexibility. In Asia excluding China, the reserve to GDP ratio increased from 5% in 1980 to about 32% in 2006; and in China, it jumped from 1% in 1980 to nearly 50% in 2008. Similarly, the Central Bank of Turkey has undertaken a net purchase of around USD 76 billion during years between 2002 and 2011, increasing total reserves to USD 93 billion.

Earlier literature treats foreign reserves as a buffer stock critical to the management of an adjustable-peg or managed-floating exchange rate regime. While useful, the buffer stock model has limited capacity to account for the recent developments in foreign reserves hoarding. The recent literature, however, has come up with explanations for reserve hoarding related with the adverse side effects of deeper financial integration of developing countries, i.e. sudden stops and reversals of capital flows a la Calvo. The empirical evidence suggests that foreign reserves can reduce both the probability of a sudden stop and the depth of the resulting output collapse when the sudden stop occurs (ACI, 2008). Aizenman and Lee (2007) link the large increase in reserves holding to the deepening financial integration of developing countries and find evidence that foreign reserves hoarding serves as a means of self-insurance against exposure to sudden stops.

The increasing importance of financial integration as a determinant for foreign reserves hoarding suggests a link between the changing configurations of the trilemma and the level of foreign reserves. Indeed, according to Obstfeld et al. (2008), the size of domestic financial liabilities that could potentially be converted into foreign currency (M2), financial openness, the ability to access foreign cur-

rency through debt markets, and exchange rate policy are all significant predictors of foreign reserve stocks. ACI (2008) demonstrates the role of reserves in mitigating the trilemma tradeoffs with an analysis in which a selected macro variable (inflation, inflation volatility, and growth volatility) is regressed on the trilemma policy configuration, foreign reserves and their interaction terms.

Instead, we investigate the role of Central Bank foreign reserves on mitigating the policy tradeoffs by examining the relation between trilemma residuals and the ratio of foreign reserves to gross domestic product. We initially perform a VAR analysis between the reserve to GDP ratio and trilemma residuals obtained from the Kalman filter analysis described in Section 4. Table 3A shows the results of this analysis in which the lag length is determined by the Akaike Information Criteria. Accordingly, statistically significant lags of the reserves have positive impact on the trilemma residuals. By only taking into account the significant lag with a deductive attitude, reserve accumulation as a ratio of GDP augments residuals obtained from the trilemma regression as shown in Table 3B. Moreover, Granger causality analysis shown in Table 3C also supports this view that reserves have a significant impact on residuals by rejecting the null hypothesis of no Granger causality at 99% confidence level. In other words, higher level of foreign reserves indicates to a sum smaller than the dependent variable of two in the trilemma regression, mitigating the tradeoffs among the policy choices of exchange rate stability, monetary independence and capital controls. Geometrically, the triangle representing the trilemma tradeoffs shrinks with higher residuals. As the triangle shrinks in size, equilibrium converges to a point within the triangle where achieving all three goals (ERS, MI, KO) at once becomes more likely.

Intuitively, the effect of reserve accumulation on policy tradeoffs can be described as follows: With reserve accumulation, domestic currency is used by the central banks to purchase foreign exchange. Although this transaction might support the exchange rate stability goal eventually, it might contradict with the monetary independence as higher domestic currency liquidity may jeopardize the target interest rate in the very short term. However, such stable exchange rate is expected to have a favorable effect on the monetary policy independence, mainly through the smaller foreign exchange pass through effect on inflation in the short-to-medium term. In the opposite situation, i.e. during capital outflows, as domestic currency depreciates central banks might opt to sell foreign exchange to the market in order to limit the increasing pass–through effect. Besides, such a policy implementation results in a reduction in the domestic currency liquidity which further helps eliminating the inflationary pressures in the short term. Yet, a strong foreign reserve

level is crucial to achieve the sustainability of this policy implementation.

5.2 Role of Required Reserves

We also investigate whether there exists a similar role for the required reserves policy as it has been actively used by the central banks in the aftermath of the global financial crisis. Theoretically, required reserves can be used as an instrument of monetary policy in controlling money supply. For instance, with a lower reserve requirement ratio, more funds can be loaned out leading to a higher money creation; however, the effect is multiplied because money obtained as loan proceeds can be re-deposited in a bank creating a loan-deposit cycle. The monetary authority can also vary the level of required reserves in a way intended to influence the spread between deposit and lending rates which will then have an impact on the growth of monetary aggregates and thus inflation. Additionally, as Gray(2011) argues, required reserves has a role in liquidity management. In fact, this may be active or passive. Using required reserves actively, a central bank can immobilize surplus reserves by administrative fiat, so that the impact of a surplus on bank behavior (low interest rates, demand for foreign exchange) does not in turn lead to inflation or depreciation (both of which involve a loss of value for the currency). Similarly, if demand for reserves exceeds supply, the central bank could lower required reserves in response. A passive approach can be adopted, if required reserves can be met on average over a period: short–term liquidity management by the commercial banks is facilitated, with a consequent reduction in short–term interest rate volatility.

In Turkish case, CBRT did not change reserve requirement ratios in the period between 2002 and late 2008. Since then, CBRT has started to use required reserves as a policy tool as described in Table 5. In the current framework, CBRT reduces required reserve ratios (RRR) during periods of capital outflows and/or weak inflows and does the opposite during periods of strong capital inflows. During times of scarce capital, RRR cuts has a rebalancing effect on the credit front, aimed at improving the diminished domestic currency liquidity conditions over the medium-term. Conversely, during strong capital inflows, CBRT carries out foreign exchange purchases to limit the appreciation of the domestic currency. While this policy of exchange rate stabilization prevents the deterioration of the current account deficit and gives rise to reserve accumulation on one hand, it expands the domestic currency liquidity level amplifying the inflationary pressures on the other. Thus, RRR hikes takes part a supportive and crucial role at this point as it diminishes the liquidity of the domestic currency. Hence, facilitating required reserves as a policy tool can

help mitigate inflationary pressures and provide exchange rate stability, i.e. ease the trilemma tradeoffs.

Within this framework, we perform a VAR analysis between the required reserve ratio and trilemma residuals obtained from the Kalman filter analysis. The former variable is obtained by simply dividing the total required reserves to total deposits irrespective of their maturities. Two lag is employed in the VAR analysis determined by both the Schwarz and Akaike Information Criteria. However, this policy becomes (statistically) significant at the 90% confidence level starting from the second quarter of 2009 as shown in Table 4A. By taking into account only the significant effect (of the second lag) with a deductive attitude, this analysis indicates that required reserves augment residuals obtained from the trilemma regression at the 99% confidence level as shown in Table 4B. Moreover, Granger causality analysis shown in Table 4C supports this view that required reserve ratio has a significant impact on residuals by rejecting the null hypothesis of no Granger causality at 99% confidence level. These findings are in line with the active reserve requirement policy implemented in the aftermath of the financial crisis.

5.3 Foreign Reserves and Required Reserves in a Small Open Economy

To make things concrete on the role of foreign reserves and required reserves in mitigating the trilemma tradeoffs, first, we can think of a case in which domestic currency faces an appreciation pressure possibly due to the capital inflows. In response, if the central bank purchases foreign currency to prevent such appreciation, this in turn will increase the liquidity of the domestic currency in the market. However, such a situation will have an impact on the interest rates due to the surged domestic currency liquidity. Hence, at this point, increasing reserve requirement ratios can limit this effect by diminishing the liquidity of the domestic currency. Conversely, if the domestic currency faces a depreciation pressure (possibly due to the capital outflows), reserve requirement ratios need to be cut if central bank opts to sell foreign currency into the market. Yet, a country might need substantial reserves level to defend its domestic currency.

6 Conclusion

In this paper, we aim to improve the ACI approach which is developed to empirically investigate the Mundell-Fleming famous trilemma concept in two dimensions.

Firstly, we showed that ACI approach of regressing a constant on the trilemma indices has misspecification problems and needs to be handled. We improve this approach by applying the Kalman filter technique to the classical linear regression to obtain time varying coefficients. Results of this technique gives more satisfactory results: residuals became smaller.

Secondly, we developed a new approach in order to show the role of reserves and reserve requirements in mitigating the trilemma tradeoffs. Accordingly, relations between the residuals obtained from the trilemma regression, foreign reserve to GDP ratio and the reserve requirement ratio are analyzed respectively. Our analysis indicates that foreign reserve to GDP ratio and the required reserve ratio augment trilemma residuals, hence mitigate the policy tradeoffs.

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Appendix

Table 1A: ACI Approach (OLS)

Means	MI	0.506
	ERS	0.580
	KO	0.079
Coefficients	MI	0.736***
	ERS	2.524***
	KO	1.433***
Contributions	MI	0.372
	ERS	1.464
	KO	0.115

[a] Monthly indices. Sample period: 2002M1 - 2011M12.

[b] *** p<0.01, ** p<0.05, * p<0.1.

Table 1B: Ramsey RESET Test (OLS)

F-statistics	2269.6	Prob. F(1,116)	0.000
Log Likelihood	362.83	Prob. $\chi^2(1)$	0.000

Table 2A: Kalman Filter Approach

	MI	0.506
Means	ERS	0.580
	KO	0.079
	MI	0.832***
Avg. Coefficients	ERS	2.502***
	KO	0.985***
	MI	0.424
Contributions	ERS	1.449
	KO	0.075

[a] Monthly indices. Sample period: 2002M1 - 2011M12.

[b] Coefficients are simple averages.

[c] *** p<0.01, ** p<0.05, * p<0.1.

Table 2B: ACI vs Kalman Approach

Residuals	Kalman Approach	ACI Approach
Sum of Squares	6.18	11.75
Standard Deviation	0.22	0.31

Table 3A: Role of Foreign Reserves: VAR Analysis

	Trilemma Residuals	Reserve/GDP
Trilemma Residuals (-1)	0.246***	0.027
	[0.089]	[0.038]
Trilemma Residuals (-2)	-0.276***	-0.080**
	[0.092]	[0.039]
Trilemma Residuals (-3)	0.143	0.067*
	[0.094]	[0.040]
Trilemma Residuals (-4)	-0.148	0.0005
	[0.0928]	[0.039]
Reserve/GDP (-1)	0.347	0.763***
	[0.219]	[0.093]
Reserve/GDP (-2)	-0.201	0.335***
	[0.278]	[0.119]
Reserve/GDP (-3)	-0.325	-0.183
	[0.271]	[0.116]
Reserve/GDP (-4)	0.507**	-0.150
	[0.220]	[0.094]
Constant	-0.364**	0.298***
	[0.175]	[0.075]

[a] Trilemma residuals are obtained from regressing trilemma indices on a constant using Kalman filter.

[b] Sample period: 2002M1 - 2011M12. Robust standard errors in brackets.

[c] *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 3B: Role of Foreign Reserves: VAR Analysis

	Trilemma Residuals	Reserve/GDP
Trilemma Residuals (-4)	-0.064	-0.019
	[0.089]	[0.065]
Reserve/GDP (-4)	0.279**	0.326***
	[0.124]	[0.090]
Constant	-0.299*	0.859***
	[0.157]	[0.114]

[a] Trilemma residuals are obtained from regressing trilemma indices on a constant using Kalman filter.

[b] Sample period: 2002M1 - 2011M12. Robust standard errors in brackets.

[c] *** p<0.01, ** p<0.05, * p<0.1.

Table 3C: Role of Foreign Reserves: Granger Causality

	F-Statistic	Prob.
Reserve/GDP does not Granger Cause Trilemma Residuals	4.914***	0.009
Trilemma Residuals does not Granger Cause Reserve/GDP	3.367**	0.038

[a] Trilemma residuals are obtained from regressing trilemma indices on a constant using Kalman filter.

[b] Sample period: 2002M1 - 2011M12. Robust standard errors in brackets.

[c] *** p<0.01, ** p<0.05, * p<0.1.

Table 4A: Role of Required Reserve Ratios: VAR Analysis

	Trilemma Residual	Required Reserve Ratio
Trilemma Residual (-1)	0.042	-0.0007*
	[0.186]	[0.004]
Trilemma Residual (-2)	-0.405**	0.008*
	[0.197]	[0.004]
Required Reserve Ratio (-1)	-7.995	1.735***
	[6.280]	[0.147]
Required Reserve Ratio (-2)	12.534*	-0.777***
	[6.760]	[0.158]
Constant	-0.201**	0.003
	[0.085]	[0.002]

[a] Trilemma residuals are obtained from regressing trilemma indices on a constant using Kalman filter.

[b] Sample period: 2009M6 - 2011M12. Robust standard errors in brackets.

[c] *** p<0.01, ** p<0.05, * p<0.1.

Table 4B: Role of Required Reserve Ratios: VAR Analysis

	Trilemma Residual	Required Reserve Ratio
Trilemma Residual (-2)	-0.282	-0.017
	[0.176]	[0.011]
Required Reserve Ratio (-2)	4.447***	0.982 ***
	[1.265]	[0.077]
Constant	-0.209**	0.004
	[0.080]	[0.004]

[a] Trilemma residuals are obtained from regressing trilemma indices on a constant using Kalman filter.

[b] Sample period: 2009M6 - 2011M12. Robust standard errors in brackets.

[c] *** p<0.01, ** p<0.05, * p<0.1.

Table 4C: Role of Required Reserve Ratios: Granger Causality

	F-Statistic	Prob.
Required Reserve Ratios do not Granger Cause Trilemma Residuals	8.274**	0.007
Trilemma Residuals do not Granger Cause Required Reserve Ratios	5.392**	0.027

[a] Trilemma residuals are obtained from regressing trilemma indices on a constant using Kalman filter.

[b] Sample period: 2009M6 - 2011M12. Robust standard errors in brackets.

[c] *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Reserve Requirement Policy Implementations in Turkey after 2010

	Tightening Phase
01.10.2010	Increase in TL RR, End of renumeration
12.11.2010	Increase in TL RR
07.01.2011	Differentiation of TL RR according to maturity, repo is now subject to RR
04.02.2011	Increase in TL RR
01.04.2011	Increase in TL RR
29.04.2011	Differentiation of FX RR according to maturity, increase in TL RR
	Expanding Phase with Reserve Building Measures
22.07.2011	Decrease in FX RR
05.08.2011	Decrease in FX RR
16.09.2011	Facility of holding up to 10% of TL RR as FX
30.09.2011	Decrease in FX and TL RR, differentiation of other TL RR according to maturity, facility of holding up to 20% of TL RR as FX
14.10.2011	Precious metals are now subject to RR, facility of maintaining the whole RR held against the precious metal deposit accounts and up to 10% of RR for foreign currency liabilities excluding precious metal deposit accounts as gold
28.10.2011	Decrease in TL RR, facility of maintaining up to 10% of TL RR as gold, facility of holding up to 40% of TL RR as FX

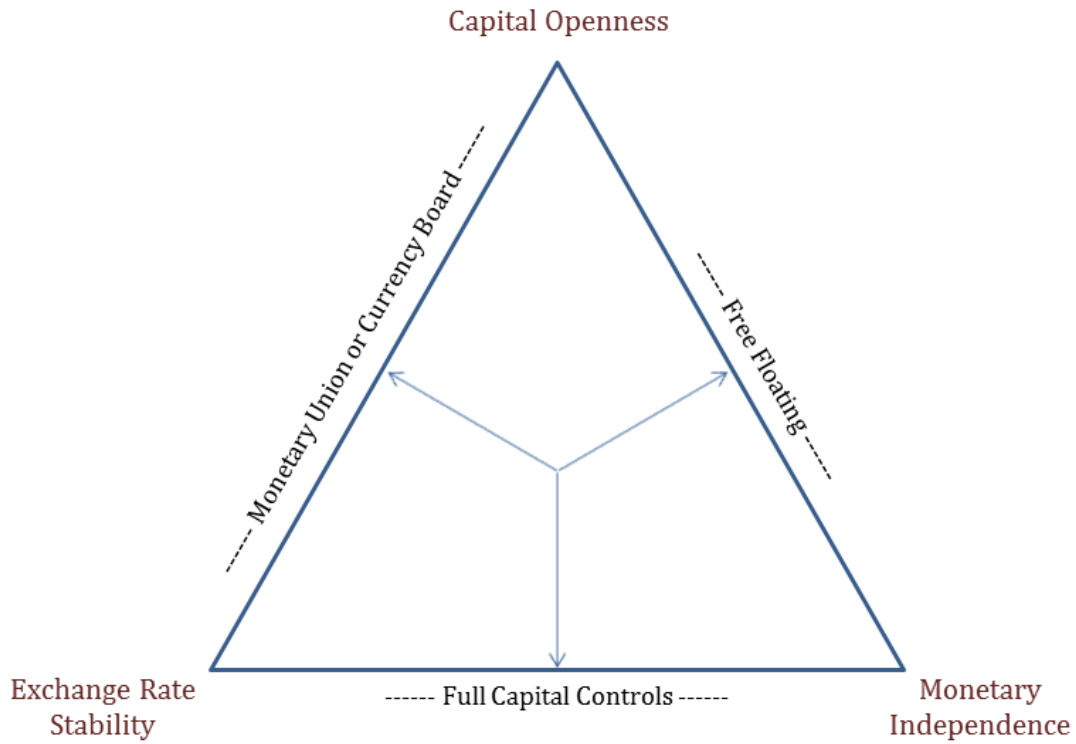

Figure 1: (Im)possible Trinity

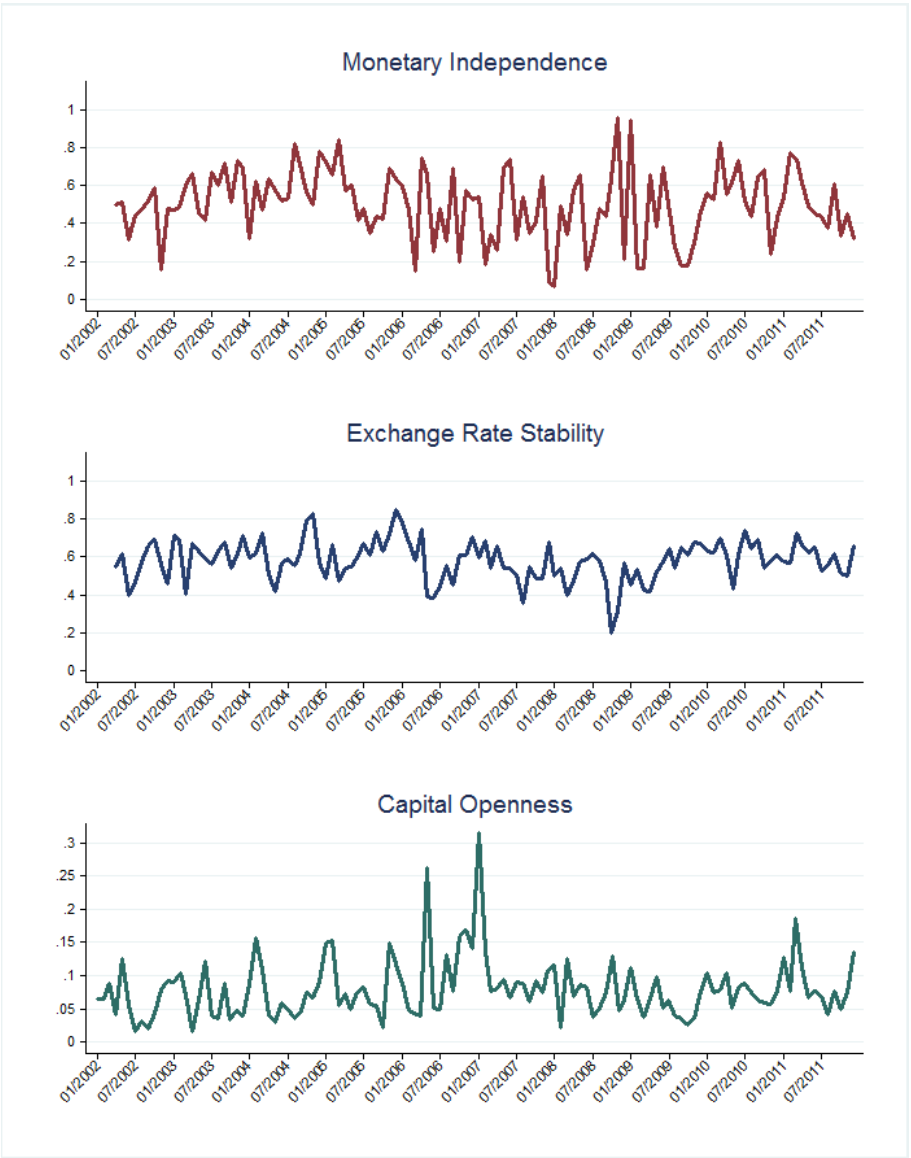

Figure 2: Trilemma Indices

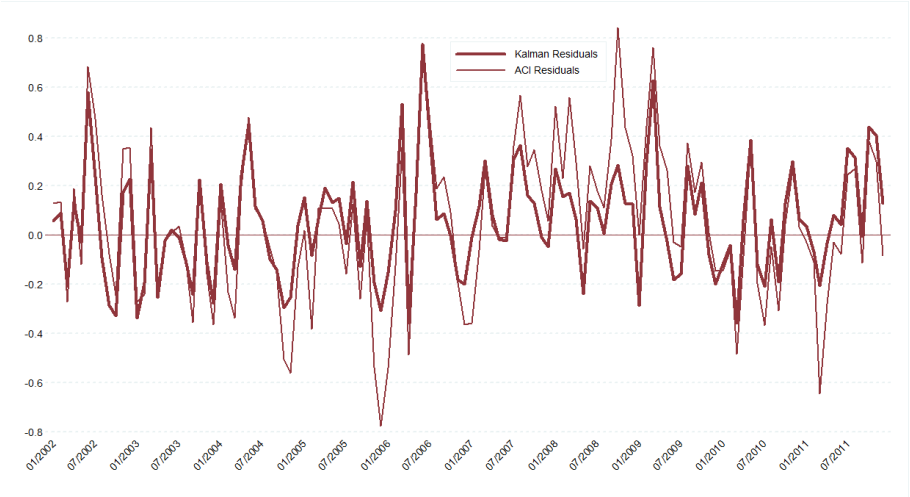

Figure 3: Residual Comparison of ACI and Kalman Approach