Modeling the exchange rate pass-through in Turkey with uncertainty and geopolitical risk: A Markov regime-switching approach

Appendix B

This work has also considered employing some global factors such as global geopolitical risk index (GPR), World uncertainty index (WUI), and World oil prices. To this end, MSM5, MSM6, and MSM7 models included additionally GPR, WUI, and World oil price growth, respectively, to the MSM4 model. All estimated outputs are given in Table B. MSM5 indicates that GPR has been found significant during bot regime 0 and regime 1. As GPR increases, the CPI growth will increase during both regimes. Before including GPR, the GDP_g and Exchange_g had positively significant impacts on CPI_g. during both regime 0 and regime 1. They have now, after including GPR, positively significant effects on CPI_g at only regime 1. The GPR might have captured some fluctuations of CPI_g that had been captured earlier by GDP_g. and Exchange_g. After inserting GPR into the model, IP_g does not affect CPI_g anymore. Economic uncertainty has now a significant negative impact on CPI_g during regime 1. This effect was positive before GPR was included in the model. This negative effect of economic uncertainty might have occurred due to a decline in aggregated demand for commodities and services under economic uncertainties.

MSM6 reveals an insignificant impact of WUI on CPI growth. Besides, although the signs and significance levels of Exchange_g, GDP_g, and IP_g are the same, Geo-Risk has no influence on CPI_g in MSM6. The impact of economic uncertainty on CPI_g is found negatively significant during regime 1. Finally, MSM7 yields that the Oil.P_g. has no impact on CPI_g during both regimes. MSM7 outputs reveal that the signs and significance levels of Exchange_g, GDP_g, IP_g, and Econ-Uncertainty remain the same, but, Geo-Risk does not affect CPI_g during both regimes. Table B indicates that among three global parameters, the GPR seems to be significant as depicted in MSM5.

Table B MS models for CPI growth (1998:Q1– 2019:Q2) with global variables

	MSM5	**MSM6**	**MSM7**
Constant	0.023652	0.032072	0.032001
(Regime 0)	[3.071]	[3.887]	[4.043]
	(0.002)	(0.000)	(0.000)
Constant	0.048676	0.074417	0.071606
(Regime 1)	[3.062]	[3.929]	[4.920]
	(0.002)	(0.000)	(0.000)
Exchange_g	0.044028	0.094809	0.096259
(Regime 0)	[1.413]	[3.246]	[3.2904]
	(0.157)	(0.001)	(0.001)
Exchange_g	0.307616	0.148357	0.168724
(Regime 1)	[4.972]	[3.177]	[3.798]
	(0.000)	(0.001)	(0.000)
GDP_g	0.000706	0.002309	0.002278
(Regime 0)	[0.760]	[2.729]	[2.673]
	(0.446)	(0.006)	(0.007)
GDP_g	0.006359	0.008741	0.009317
(Regime 1)	[4.129]	[4.074]	[5.630]
	(0.000)	(0.000)	(0.000)
IP_g	-0.109470	-0.135792	-0.141473
(Regime 0)	[-1.531]	[-1.893]	[-1.915]
	(0.125)	(0.058)	(0.055)
IP_g	0.095852	-0.111780	-0.042785
(Regime 1)	[0.619]	[-0.883]	[-0.284]
	(0.535)	(0.376)	(0.776)
Econ-Uncertainty	0.001046	0.000446	0.001175
(Regime 0)	[0.083]	[0.036]	[0.096]
	(0.933)	(0.971)	(0.923)
Econ-Uncertainty	-0.086395	0.088186	0.074967
(Regime 1)	[-1.971]	[2.993]	[2.422]
	(0.048)	(0.002)	(0.015)
Geo-Risk	-0.000144	-0.000118	-0.000113
(Regime 0)	[-1.929]	[-1.632]	[-1.616]
	(0.053)	(0.102)	(0.106)
Geo-Risk	6.56E-05	-0.000113	-9.89E-05
(Regime 1)	[0.489]	[-1.034]	[-0.957]
	(0.624)	(0.300)	(0.338)
GPR	5.63E-05	-	-
(Regime 0)	[4.444]		
	(0.000)		
GPR	0.000179	-	-
(Regime 1)	[3.636]		
	(0.000)		

WUI (Regime 0)	-	4.22E-08 [0.148] (0.881)	-
WUI (Regime 1)	-	-1.60E-07 [-0.176] (0.859)	-
Oil.P_g (Regime 0)	-	-	4.78E-05 [0.306] (0.759)
Oil.P_g (Regime 1)	-	-	-0.000260 [-0.729] (0.465)
Log Sigma	-4.194314 [-48.911] (0.000)	-4.244940 [-48.205] (0.000)	-4.250347 [-47.931] (0.000)
	Transition Variable: Geo-Risk	Transition Variable: Geo-Risk.	Transition Variable: Geo-Risk
b1	0.042293 [2.266] (0.023)	0.017227 [2.123] (0.033)	0.017131 [2.106] (0.035)
b2	-0.046281 [-3.151] (0.001)	-0.029666 [-4.107] (0.000)	-0.029559 [-4.069] (0.000)
AIC SC	-5.026970 -4.538440	-4.860716 -4.372186	-4.869108 -4.380577

Notes: The dependent variable is CPI growth. The independent variables are given in the first column. The values in brackets are t values, and the t prob. values are given in parentheses.

It seems that MSM5 fits data better than MSM4 does in terms of AIC and SC. However, one might question this statistical output which is in favor of MSM5 in terms of two critical points. First, can IP_g, which is a proxy of the production level of the Turkish economy, be insignificant in determining the price level in Turkey during both regimes? The neutrality of Ip_g might contrast with theoretical AS-AD models in which supply and demand simultaneously determine the general level of prices.

Secondly, what would happen to the output of MSM5 if the transition variable changed? When we employed the transition variable of GPR instead of Geo-Risk, economic uncertainty becomes insignificant during both regime 1 and regime 2. This output might also contrast with theoretical and/or empirical evidence. For instance, according to Bachmann et al. (2013),

economic uncertainties lead to significant reductions in production prominently. Watugala (2015) also indicates that commodity futures volatility is significantly determined by macroeconomic uncertainty. Bakas and Triantafyllou (2020) reveal that economic uncertainty has a significant negative influence on commodity markets' volatility, specifically on crude oil market volatility.

These two critical points lead us to the conclusion that the estimations of MSM4 might be more valid than those of MSM5. Besides, in estimations of MSM5 with transition variable of GPR, AIC and SC are -4.95 and -4.46, respectively. This statistical result also shows that MSM5 results cannot be superior to MSM4 results in terms of SC. Overall; this paper might reveal that the regime shifts predictions of CPI_g in MSM4 can be considered more efficient and consistent among other MS predictions given in Table 4 (in main text) and Table B.

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