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Interest Rate Pass-Through and Monetary Transmission Mechanism in Turkey

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ABSTRACT

This paper examines the pass-through of interest rates from changes in the official interest rate of the Central Bank of Turkey (CBRT) to market interest rates in Turkey. In this context, we have collected six market interest rates series, such as the bank rate (BR), the lending rate (LR), the deposit rate (DR), the money market rate (MMR), the Treasury bill rate (TBR), and the government bond yield (GBY). First, we conducted an analysis of the correlation of the series. Second, we examined the cointegration of the series and then used Bayesian vector autoregression to estimate the response of interest rates to the bank rate. The results show that there is a long-run relationship between the interest rates and that there is a strong correlation between the bank rate and the third rates such as the money market rate, the deposit rate (DR) and the lending rate. There is a complete pass-through between the bank rate and the landing rate. There is a strong pass-through between the money market rate and the bank rate, and a strong pass-through between the Treasury bill rate, the deposit rate, and the bank rate. There is no pass-through between the government bond yield and the bank rate.

Key Words: Interest Rate, Pass-Through, Monetary Transmission Mechanism, Monetary Policy

JEL Codes: E43, E44, E52, E58

Türkiye'de Faizler Arası Geçişkenlik ve Parasal Aktarım Mekanizması

ÖZ

Bu çalışmada, Türkiye Cumhuriyet Merkez Bankası (TCMB) resmi faiz oranlarındaki değişikliklerin Türkiye'deki piyasa faiz oranlarına geçişkenliği incelenmektedir. Bu amaç doğrultusunda, mümkün olduğunca çeşitliliği fazla olan piyasa faiz oranları kullanılmıştır. Bu kapsamda Banka faizi (BR), borç verme faizi (LR), mevduat faizi (DR), para politika faizi (MMR), Hazine bonosu faizi (TBR) ve Devlet tahvili faizi (GBY) olmak üzere altı piyasa faiz oranı analize dahil edilmiştir. Veri setimiz Ocak 2002-Mart 2021 dönemini kapsamaktadır. Daha önceki çalışmaları takiben birçok analiz seti uygulanmıştır. İlk olarak serilerin korelasyon analizini, ve sonra serilerin eşbütünleşikliği ve ardından Bayesian Vektör Otoregresyonu kullanılarak faiz oranlarının banka faiz oranına reaksiyonunu tahmin edilmektedir. Sonuçlara göre, faiz oranı arasında uzun dönemli bir ilişki olduğunu ve Banka faizi ile para piyasası oranı, mevduat oranı (DR) ve borç verme oranı gibi faiz oranlarının arasında güçlü bir korelasyon mevcuttur. Banka oranı ile depozit oranı arasında tam geçişkenlik olduğu tespit edilmiştir. Para piyasası faizi ile banka faizi arasında aşırı geçişkenlik, Hazine bonosu faizi, mevduat faizi ve banka faizi arasında güçlü geçişkenlik olduğu kanıtına varılmıştır. Devlet tahvili getirisi ile banka faizi arasında herhangi bir geçişkenliğe rastlanılmamıştır.

Anahtar Kelimeler: Faiz Oranı, Geçişkenlik, Parasal Aktarım Mekanizması, Para Politikası

JEL Kodları: E43 E44 E52 E58

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1. Introduction

According to the official report of the Central Bank of Turkey (CBRT), Turkey's annual inflation rate was 14.60% in 2020, although the inflation target was 5%. The CBRT states that the high inflation is due to the following.

- Turkey's structural transformation,
- Rigidities caused by a history of high inflation,
- Measurement distortions resulting from the increase in quality,
- The EU harmonization process.

In order to stabilize inflation and achieve the inflation target, a successful monetary policy is required, which depends on the consistency of market interest rates such as capital market interest rates, other money market interest rates and commercial bank retail rates. (Aziakpono & Wilson, 2013).

There is a consensus that the short-term interest rate is the most important instrument for controlling inflation. Inflation can be reduced by increasing short-term interest rates (Alvarez et al., 2001). Short-term interest rates provide a balance between investment and saving that increases the efficiency of capital allocation for productive purposes (Hennecke, 2017). Low interest rates lead to large scale investment and also it could cause price bubbles especially in real states markets (Bordo & Landon-Lane, 2013). According to (Gambacorta, 2011) low interest rates have at least three effects on risk: first, encourage asset managers to take more risk for arbitrary and contractual behavioral reasons. Second, low interest rates-through their impact on cash flows, valuations, and income-may induce banks to take more risk. Third, through monetary policy mechanism it effect the communication policies of a central bank. Higher market interest rates lead to a decline in fixed-income bond prices, and vice versa[3]. There is an important relationship between the process of retail interest rate pass-through and the process of monetary policy transmission. Contractionary/expansionary monetary policy is assumed to lead to an ncrease/decrease in money market rates than to affect the exchange rate and aggregate demand. (B. S. Bernanke & Blinder, 1988), (B. Bernanke & Gertler, 1989) and (B. Bernanke, 1993) emphasis that banks are not neutral conveyors of monetary policy impulses.

The process of monetary policy and transmission through the traditional interest rate occur in two ways: the first is known as the "monetary policy approach", which shows the impact of a change in monetary policy on the transmission at the long-term landing (deposit). The second is the "cost of funds approach," which shows the indirect transmission channel (Bondt, 2005).

The indirect transmission channel is decomposed into two stages (Coricelli et al., 2006): the first stage measures how changes in the policy rate convey to short-term money market rates (interbank rates), which according to (Gopalan & Rajan, 2017) it has been observed as the target rate for pass-through from policy to interbank rates. The other is the pass-through through the government bond market or how changes in interbank rates affect other yields, deposit rates and lending rates.

Some studies such as (B. S. Bernanke & Blinder, 1988), (B. S. Bernanke & Blinder, 1992) and (Christiano et al., 1999) for the United States, (Peersman & Smets, 2001) and (van Els et al., 2003), (Winker, 1999) and (Cottarelli et al., 1995) for the Euro area and Euro countries such as Germany and Italy, focus mainly on advanced markets. These studies are mainly concerned with the impact of traditional interest rate changes on real activity and inflation. Related literature mainly examined the effects of traditional interest rate changes on real activity and inflation, but few studies such as (Tai et al., 2012), (Aziakpono & Wilson, 2013), (Can et al., 2020) and (Wang & Lee, 2009) focused on emerging markets.Some studies such as (B. S. Bernanke & Blinder, 1988), (Christiano et al., 1999) and (B. S. Bernanke & Blinder, 1992) for the USA, (Peersman & Smets, 2001) and (van Els et al., 2003),

[3] https://www.sec.gov/files/ib_interestraterisk.pdf

(Winker, 1999) and (Cottarelli et al., 1995) for the euro area and euro countries such as Germany and Italy, focus mainly on advanced markets.

However, some studies belong to a different category of transmission mechanisms. For example, (Wu, 2008); (Taylor & Williams, 2009); (Christensen & Rudebusch, 2012), (Gregor, et al., 2019) focused on the macroeconomic impact and pass-through of interest rates. However, few studies focus on interest rate pass-through and monetary policy in Turkey. In this study, we try to focus on the pass-through between interest rates of monetary policy transmission mechanism in Turkey.

2. Materials and Methodology

This paper aims to analyze interest rate pass-through within the monetary transmission mechanism in Turkey, focusing on interest rates that cover the widest possible range of market rates. In this context, we follow (Marotta, 2009) and (Aziakpono & Wilson, 2013). In this part, we analyze the pass-through of changes in the CBRT official interest rate to market interest rates in Turkey. Our goal is to use interest rates that cover as wide a range of market interest rates as possible. (Aziakpono & Wilson, 2013) have suggested the following interest rates:

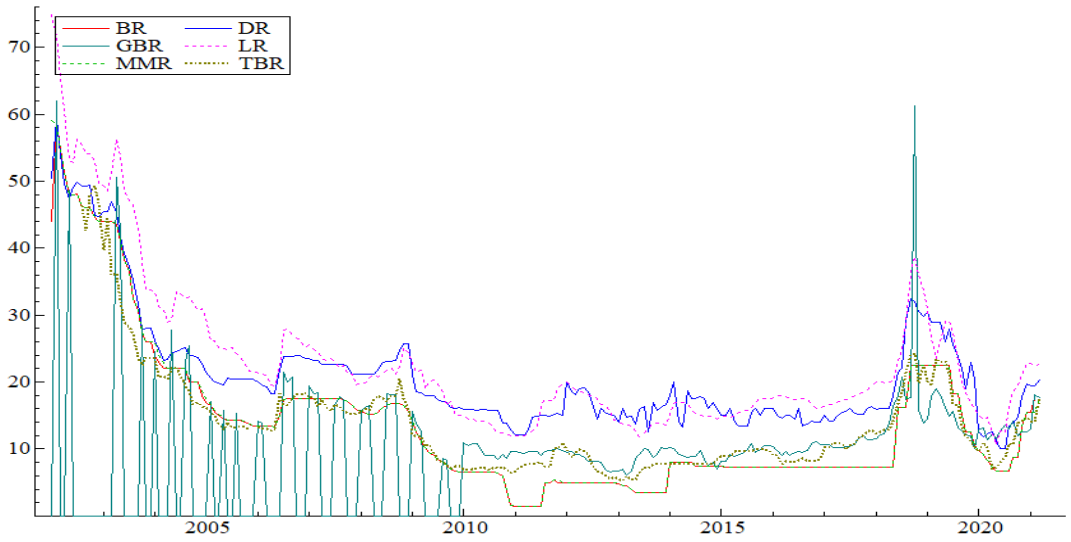
a. The Bank rate (BR),
b. Government bond yield (GBY).
c. Deposit rate (DR),
d. Lending rate (LR),
e. Money market rate (MMR),
f. Treasury bill rate (TBR).

We collected six market interest rates, which are summarized in table 1: Our data cover the period from January 2002 to March 2021. Table 1 shows the series and Figure 1 presents the series in full size.

Table 1: Interest rates

Interest rates	definition	abbreviation	obtained from
the Bank rate	Rate at which the CBRT discounts papers of commercial to commercial banks	BR	IMF
lending rate	prime lending rates of major commercial banks (Consumer landing rate on Turkish lira)	LR	CBRT
money market rate	Central Bank Policy Rate:rate on interbank deposits: Immediate Rates: Less than 24 Hours: Call Money/Interbank Rate for Turkey	MMR	FRED
Treasury bill rate	tender rate on 91-day bills	TBR	Investing.com
The government bond yield	Long-Term Government Bond Yields (Turkey 10-Year Bond Rates)	GBY	FRED and Investing.com
deposit rate (DR)	rate on short run notice fixed deposits	DR	IMF

Figure 1: Interest Rates, 2002m01–2021m04



As Table 2 shows, LR has the highest correlation with MMR with a correlation of 96.2%, followed closely by BR with a correlation of 96.1%, and DR is also quite highly correlated with BR with a correlation coefficient of 95%. The correlation between LR and TBR is also very high at 94.2%. The lowest correlation is with GBR with a correlation coefficient of 4.8%. The correlation results show that all interest rates except GBR are strongly correlated with LR. The results are consistent with the findings of (Aziakpono & Wilson, 2013). Table 3 shows the correlation matrix (first difference series):

Table 2: Correlation Matrix (Level Series)

	BR	DR	GBR	**LR**	MMR	TBR
BR	1					
DR	0.9606 (0.000)	1				
GBR	0.015 (0.000)	0.024 (0.000)	1			
LR	**0.961** (0.000)	**0.950** (0.000)	**0.048** (0.000)	1		
MMR	0.999 (0.000)	0.959 (0.000)	0.014 (0.000)	**0.962** (0.000)	1	
TBR	0.964 (0.000)	0.951 (0.000)	0.011 (0.000)	**0.942** (0.000)	0.964 (0.000)	1

As shown in Table 3, the correlation between ΔBR-ΔMMR is 0.98, which means that there is a stronger linear relationship between them. ΔLR has the most modest or moderate correlation with ΔMMR with a correlation of 52%, closely followed by ΔBR with a correlation of 50%. ΔDR correlates with ΔLR with a correlation coefficient of 40.2%, which is lower than ΔMMR and BR higher than ΔTBR and ΔGBR, the correlation of ΔTBR-ΔLR and ΔGBR-ΔLR is 26% and 22%, respectively. The coefficient of the table is 95%.

Table 3: Correlation Matrix (First Difference Series)

	ΔBR	ΔDR	ΔGBR	ΔLR	ΔMMR	ΔTBR
ΔBR	1					
ΔDR	0.463 (0.000)	1				
ΔGBR	0.051 (0.450)	-0.025 (0.705)	1			
ΔLR	**0.500** (0.000)	**0.402** (0.000)	**0.220** (0.000)	1		
ΔMMR	**0.982** (0.000)	0.460 (0.000)	0.082 (0.220)	**0.520593** (0.000)	1	
ΔTBR	0.329 (0.000)	0.269 (0.000)	0.061 (0.360)	**0.267585** (0.000)	0.340 (0.000)	1

For the stationary analysis of the time series, the Phillips-Perron test (PP) and the Augmented Dickey-Fuller test (ADF) are used as unit root tests to determine the stationary level of the variables. Table 4 shows the results of the unit root test;

Table 4: Unit Root Test[4]

Variables	ADF[5]		PP[6]	
	Intercept	Intercept and trend	Intercept	Intercept and trend
BR	-3.48(3)***	-3.94(1)**	-2.60(7)**	-1.83(6)
DR	-3.26(0)***	-3.32(6)**	-3.25(4)**	-3.01(4)
GBR	-3.74(8)***	-5.01(9)***	-12.85(2)***	-13.35(8)***
IR	-3.59(3)***	-3.33(2)**	-5.17(2)***	-4.27(2)***
MMR	-2.99(3)**	-2.41(3)	-4.39(9)***	-3.20(8)*
TBR	-5.57(6)*	-4.50(6)***	-4.29(5)***	-3.38(5)**

Note: The signs *, ** and *** represent; 10%, 5%, 1% significance level, respectively and parenthesis show the optimum number of lags.

The null hypostasis of the unit root is largely rejected for each of the six series, and the results of table 1 suggest that interest rates are mainly stationary at I(0). Therefore, we applied various econometric methods to analyze the cointegration of the interest rate pairs using the two-step Engle-Granger method and the error correction test. Before estimating Engle-Granger, we apply the correlation test. Table 2 and Table 3 show the correlation of the original (level series) interest rate and the differences. Following (Marotta, 2009) and (Aziakpono & Wilson, 2013), a brief description of the basic model is as follows:

$$MR_t = \alpha_0 + \alpha_1 BR_t + \varepsilon_t \quad (1)$$

Official interest rate is exogenously determined by the CBRT and BR_t denotes the official interest rate. Market interest rates is denotes by MRt which endogenously determined by market interest rates (in our case MMR, DR, LR, TBR, and GBY); εt is the stochastic error term. In additional α0 and α1 are the long-run coefficients, respectively.

If the series are found to be stationary at the levels, the model is tested using the ordinary least squares (OLS) method. However, some of the variables are not stationary at the level, but are stationary in the first difference I(1). The cointegration test is applied. If the variables are stationary in the combination of I(0) and I(1), the ARDL bound test can be applied. As Table 1 shows, almost all the series are mainly stationary at the level, so we will apply the ordinary least squares (OLS) method and the two-step Engle-Granger method to determine whether the pair of series is cointegrated or not. Three methods are used in the study to determine how interest rates interact with each other. The value of α_1 is expected to be 0

[4] All series are seasonally adjusted
[5] Based on Schwartz Info Criterion
[6] Based on Bartlett Kernel

$\leq \alpha_1 \leq 1$. When α_1 is close to zero, the pass-through of long-run is slow, while a value of 1, indicates complete pass-through. Due to high switching costs, asymmetric information, market imperfections, fixed menu costs, and negative customer reactions, it is unlikely that the value of $\alpha_1 = 1$. It is also possible that $\alpha_1 > 1$, since in this case there is an over-pass-through. This may be the case when banks apply for a higher interest rates to compensate for the higher risks resulting from asymmetric information, rather than reducing the supply of credit (Bondt, 2005). The results of estimating the cointegration of pair of interest rates of model (1) are presented in Table 5:

Table 5: Estimated Long-run Pass-Through Equilibrium Relationships

	α_0	α_1	Level of pass-through	EC_{-1}
LR	9.27***	0.98***	Almost complete pass-	-0.14***
	(29.27)	(56.56)	through	(-4.43)
MMR	-0.12	1.014***	Over pass-through	-0.81*
	(-1.21)	(-0.12)		(-1.68)
TBR	3.24***	0.81***	Strong Pass-through	-0.17***
	(13.39)	(54.53)		(-3.23)
DR	10.13***	0.78***	Strong pass-through	-0.08***
	(45.01)	(63.17)		(-3.59)
GBR	8.64***	0.07	Almost no pass-through	-0.32***
	(9.02)	(1.42)		(-3.31)

Note: The signs * and *** represent; 10%, 1% significance level, respectively and parenthesis show the t-statestics value.

The results in table 3 suggest that there is cointegration between the interest pairs and BR in all models. The strongest evidence of a nearly complete pass-through is found between LR-BR and MMR-BR. Even MMR-BR is over pass-through. The level of pass-through between TBR-BR and DR-BR is strong, but not complete. There is no pass-through between GBR-BR.

As mentioned above, the basic cointegrating regression model for all interest rates to test their long-run relationship is summarised in Table 6.

Table 6: Residual-Based Cointegration Test

	Coefficients		Coefficients	
variables	Engle-Granger Cointegrating Regression (based on ADF)		Phillips-Ouliaris Cointegrating Regression (based on PP)	
	$\hat{\tau}$ [7]	$\hat{Z}$ [8]	$\hat{\tau}$ [9]	$\hat{Z}$ [10]
BR	-6.86***	-123.16***	-6.82***	-122.20***
DR	-3.76	-32.84	-5.59***	-55.44***
GBR	-3.78*	-37.46*	-10.67***	-140.6***
LR	-4.31	-34.73	-4.41*	-36.37***
MMR	-6.84***	-120.69***	-6.83***	-120.04***
TBR	-6.17***	-63.49***	-6.16***	-62.89***

Note: sighs ***,* represent 1% and 10% significance level.

Table 6 shows that the null hypothesis is no cointegration, which is rejected for both the Engle-Granger and Phillips-Ouliaris cointegration regressions. Thus, all variables are cointegrated and have a long-run relationship.

Tables 5 and 6 show the long-run relationships and the summary of the results of the cointegration test. Overall, the five two-stage cointegration tests and the residual-based cointegration tests are identical and both reject the null hypothesis of no cointegration.

[7] T-stat
[8] Normalized autocoralation coeff.
[9] T-stat
[10] Normalized autocoralation coeff.

3. Bayesian VARs and Impulse Response Functions:

Bayesian analysis requires knowledge of the properties of the prior, likelihood, and posterior distributions. The prior distribution is the external distribution information that reflects researchers' beliefs about the parameters of interest in the research.

(Giannone et al., 2015) and (Marcellino et al., 2012) propose different ways to optimally select hyperparameters. Following (Carriero, n.d.) and considering our hypotheses, we also improved the parameters of the prior with new alternatives to form the underlying covariance matrices that form essential additives of the prior. Our hyperparameters are listed in Table 7;

Table 7: Bayesian VAR Hyperparameters[11]

AR (1)	0
μ6	There is no initial observation dummies
$\boldsymbol{\lambda_0}$	1
$\boldsymbol{\lambda_1}$	0.1
$\boldsymbol{\lambda_2}$	0.99
$\boldsymbol{\lambda_3}$	1

Table 8 shows that MMR responds strongly positive to the stimulus of BR in all periods. The response of LR and TBR is also strong and positive in the first 10 periods. Although the response of DR is strong initially, it is generally weak. The responses of GBR to BR are initially positive but reverse to negative and are so weak that they are not statistically significant. Thus, there is no significant pass-through between GBR and BR.

These results are consistent with the results in Table 5. Therefore, there is an overcomplete pass-through between MMR and BR. The pass-through between TBR-BR and DR-BR is strong. In contrast, the pass-through between DR, GBR and BR is weak.

Table 8: Response of Series to Impulse of BR

Period	Response of DR	Response of GBR	Response of LR	Response of MMR	Response of TBR
1	0.558642	0.647277	0.521434	1.029253	0.539487
2	0.513831	0.107235	0.524090	0.929002	0.568511
3	0.492518	-0.008916	0.533023	0.841921	0.573604
4	0.480823	-0.024941	0.541278	0.776879	0.564562
5	0.471103	-0.020054	0.545560	0.726156	0.547818
6	0.460367	-0.012453	0.544857	0.684559	0.527298
7	0.447862	-0.006095	0.539366	0.648849	0.505261
8	0.433757	-0.001515	0.529820	0.617046	0.482955
9	0.418513	0.001549	0.517112	0.587957	0.461047
10	0.402607	0.003487	0.502104	0.560863	0.439867
11	0.386441	0.004640	0.485542	0.535338	0.419563
12	0.370317	0.005268	0.468034	0.511122	0.400182

Conclusion

This study makes several contributions to the empirical literature investigating the interaction between policy rates and market rates, the pass-through of monetary policy impulses, via changes in market rates, to bank rates and finally long run relationship of six interest rates of monetary system of Turkey. Interest rate pass-through is an important issue to address because a fuller and quicker pass-through of market and official interest rates to bank interest rates strengthens monetary policy transmission that it is a key issue to central banks to manage their monetary policy and price stability programs.

Limitations of our study are the absence or non-entry of variables or techniques that can assess the impact of the recent Turkish economic crisis on Turkish monetary policy. Another limitation is the

[11] Litterman-Minnesota

degree of independence of the Turkish Central Bank and measure of impact of independency on Turkey central Bank's policies.

This study examines the extent of pass-through between market interest rates and changes in the official interest rate of the Central Bank of the Republic of Turkey, i.e., how commercial bank interest rates in Turkey respond to the official interest rate. For this purpose, six interest rate series such as lending rate, money market rate, bank rate, treasury bill rate, deposit rate and government bond yield are used during the period from January 2002 to March 2021. All data are monthly and seasonally adjusted. Following previous studies, we first conducted an analysis of the correlation of the series. Second, we examined the cointegration of the series and then used Bayesian vector autoregression to estimate the response of interest rates to the policy rate. The results show that there is a long-run relationship between interest rates and that there is a strong correlation between the bank rate and third interest rates such as the money market rate, the deposit rate (DR) and the lending rate. There is a complete pass-through between the bank rate and the landing rate. There is an over pass-through between the money market rate and the bank rate, and there is strong pass-through between the Treasury bill rate, the deposit rate, and the bank rate. There is no pass-through between government bond yield and the bank rate.

References

Alvarez, F., Lucas, R. E., & Weber, W. E. (2001). Interest Rates and Inflation. *The American Economic Review*, *91*(2), 219–225.

Aziakpono, M. J., & Wilson, M. K. (2013b). Interest Rate Pass-through and Monetary Policy Regimes in South Africa. In Working Papers (No. 259; Working Papers). African Economic Research Consortium, Research Department. https://ideas.repec.org/p/aer/wpaper/259.html

Bernanke, B. (1993). Credit in the macroeconomy. *Quarterly Review*, *18*(Spr), 50–70.

Bernanke, B., & Gertler, M. (1989). Agency Costs, Net Worth, and Business Fluctuations. *The American Economic Review*, *79*(1), 14–31.

Bernanke, B. S., & Blinder, A. S. (1988). Credit, Money, and Aggregate Demand (Working Paper No. 2534; Working Paper Series). National Bureau of Economic Research. https://doi.org/10.3386/w2534

Bernanke, B. S., & Blinder, A. S. (1992). The Federal Funds Rate and the Channels of Monetary Transmission. *The American Economic Review*, *82*(4), 901–921.

Bondt, G. J. de. (2005). Interest Rate Pass-Through: Empirical Results for the Euro Area. German Economic Review, *6*(1), 37–78. https://doi.org/10.1111/j.1465-6485.2005.00121.x

Bordo, M., & Landon-Lane, J. (2013). Does Expansionary Monetary Policy Cause Asset Price Booms; Some Historical and Empirical Evidence (NBER Working Paper No. 19585). National Bureau of Economic Research, Inc. https://econpapers.repec.org/paper/nbrnberwo/19585.htm

Can, U., Bocuoglu, M. E., & Can, Z. G. (2020). How does the monetary transmission mechanism work? Evidence from Turkey. *Borsa Istanbul Review*, *20*(4), 375–382. https://doi.org/10.1016/j.bir.2020.05.004

Carriero, A. (n.d.). Separately, each of the two equations constitutes a restricted ADL model: Same #lags for both Y1,t and Y2,t in both equations. Current value of additional explanatory variable ("Xt ") is ruled out. 69.

Christensen, J. H. E., & Rudebusch, G. D. (2012). The Response Of Interest Rates To Us And Uk Quantitative Easing. *The Economic Journal*, *122*(564), 385–414.

Christiano, L. J., Eichenbaum, M., & Evans, C. L. (1999). Monetary policy shocks: What have we learned and to what end? In Handbook of Macroeconomics (Vols. 1, Part A, pp. 65–148). Elsevier. https://ideas.repec.org/h/eee/macchp/1-02.html

Coricelli, F., Égert, B., & MacDonald, R. R. (2006). Monetary Transmission Mechanism in Central and Eastern Europe: Gliding on a Wind of Change. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.949468

Cottarelli, C., Ferri, G., & Generale, A. (1995). Bank Lending Rates and Financial Structure in Italy: A Case Study. Staff Papers - International Monetary Fund, 42(3), 670. https://doi.org/10.2307/3867536

Doan, T., Litterman, R., & Sims, C. (1986). Forecasting and Conditional Projection Using Realistic Prior Distribution. Econometric Reviews, 3.

Gambacorta, L. (2011). The Risks of Low Interest Rates. Revista ESPE - Ensayos Sobre PolÃ-tica EconÃ3mica, 29(64), 14–31.

Giannone, D., Lenza, M., & Primiceri, G. (2015). Prior Selection for Vector Autoregressions. *The Review of Economics and Statistics*, *97*(2), 436–451.

Gopalan, S., & Rajan, R. S. (2017). Does foreign bank presence affect interest rate pass-through in emerging and developing economies? Journal of Macroeconomics, *54*, 373–392. https://doi.org/10.1016/j.jmacro.2017.06.010

Gregor, J., Melecký, A., & Melecký, M. (2019). INTEREST RATE PASS-THROUGH: A META-ANALYSIS OF THE LITERATURE. Journal of Economic Surveys, John Wiley & Sons, Ltd, 35(1), 141–191. https://doi.org/10.1111/joes.12393

Hennecke, P. (2017). The interest rate pass-through in the low interest rate environment: Evidence from Germany (Working Paper No. 151). Thünen-Series of Applied Economic Theory - Working Paper. https://www.econstor.eu/handle/10419/157232

Litterman, R. B. (1986). Forecasting with Bayesian Vector Autoregressions: Five Years of Experience. Journal of Business & Economic Statistics, *4*(1), 25–38. JSTOR. https://doi.org/10.2307/1391384

Marcellino, M., Carriero, A., & Clark, T. E. (2012). Real-time nowcasting with a Bayesian mixed frequency model with stochastic volatility (No. 1227; Working Papers (Old Series)). Federal Reserve Bank of Cleveland. https://ideas.repec.org/p/fip/fedcwp/1227.html

Marotta, G. (2009). Structural breaks in the lending interest rate pass-through and the euro. Economic Modelling, 26(1), 191–205. https://doi.org/10.1016/j.econmod.2008.06.011

Peersman, G., & Smets, F. (2001). The monetary transmission mechanism in the euro area: More evidence from VAR analysis (Working Paper Series No. 91). European Central Bank. https://econpapers.repec.org/paper/ecbecbwps/200191.htm

Tai, P. N., Sek, S. K., & Har, W. M. (2012). Interest Rate Pass-Through and Monetary Transmission in Asia. International Journal of Economics and Finance, *4*(2), p163. https://doi.org/10.5539/ijef.v4n2p163

Taylor, J. B., & Williams, J. C. (2009). A Black Swan in the Money Market. American Economic Journal: Macroeconomics, 1(1), 58–83. https://doi.org/10.1257/mac.1.1.58

van Els, P., Locarno, A., Mojon, B., & Morgan, J. (2003). New Macroeconomic Evidence on Monetary Policy Transmission in the Euro Area. Journal of the European Economic Association, *1*(2/3), 720–730.

Wang, K.-M., & Lee, Y.-M. (2009). Market volatility and retail interest rate pass-through. Economic Modelling, 26(6), 1270–1282. https://doi.org/10.1016/j.econmod.2009.06.002

Winker, P. (1999). Sluggish adjustment of interest rates and credit rationing: An application of unit root testing and error correction modelling. Applied Economics, *31*(3), 267–277. https://doi.org/10.1080/000368499324255

Wu, T. (n.d.). On the Effectiveness of the Federal Reserve's New Liquidity Facilities. 32.