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Author (s):	Hafsa Hina, Henna Ahsan, Hania Afzal
Affiliation (s):	Pakistan Institute of Development Economics, Pakistan
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Department of Banking and Finance, Dr. Hasan Murad School of Management (HSM)
University of Management and Technology, Lahore, Pakistan

Impact of the Yield Spread on Economic Contraction in Pakistan: An Adverse Relationship

Hafsa Hina*, Henna Ahsan, and Hania Afzal

Pakistan Institute of Development Economics, Pakistan

Abstract

The yield spread has a positive association with future economic expansion, up to a certain extent. An inverted yield curve is recognized as a potential indicator of economic contraction. This study aims to examine the impact of the yield spread, calculated as the difference between the weighted average rates of return on 5-year deposits and the 3-month rates of return, on the economy of Pakistan. To measure the contraction and expansion probabilities, Hamilton's (1989) Markov switching model is used. Afterwards, the impact of yield spread on economic contraction is analyzed by applying the ARDL bounds testing approach, based on 40 years of data ranging from 1980 to 2020. The findings indicate a positive association among the yield spread and the probability of contraction. Therefore, this study suggests that whenever there is an increase in yield spread, economic contraction rather than growth is expected. Whereas, control variables such as migration and foreign direct investment (FDI) reduce the chances of economic contraction. On the contrary, an increase in the price level increases its probability.

Keywords: ARDL, contraction probabilities, economic contraction, economic growth, foreign direct investment (FDI), yield spread

JEL Codes: B23, E3, E4.

Introduction

It is not always possible to predict economic contractions. If it had been possible, economies would definitely plan to handle such contractions or to completely avoid them. However, there are some warning signs that may help the economists to predict that an economic contraction is on its way to happen. It has been stated often that an inverted yield curve is an important indicator of economic contraction. When long-term interest rates are surpassed by short-term interest rates, market sentiment suggests a pessimistic outlook for long-term performance. Hence, it is expected that

*Corresponding Author: hafsahina@pide.org.pk

yields on long-term fixed-income investments would continue to decline. On the other hand, a positively sloped yield curve usually leads to an increase in economic growth. Kessel (1971) was the first to notice the association between interest rate and business cycles.

In recent times, the research examining the predictive capacity of the yield curve has gained considerable popularity, particularly in developed countries. The reason is its scope in forecasting both nominal and real macroeconomic variables (Chinn & Kucko, 2015). These include predicting future interest rates (Fama, 1975), consumption (Harvey, 1988), employment (Bernanke, 1990), inflation rates (Alessandri & Mumtaz, 2017; Gomez-Biscarri, 2009), business cycle fluctuations, and economic growth (Gilchrist & Zakrajsek, 2012; Abdymomunov, 2013; Nakaota & Fukuta, 2013).

The yield spread is regarded as a significant indicator of both inflation and economic growth. This notion is supported by a wide range of research (Stock & Watson, 2003). Sabes and Sahuc (2023) stated that yield curve inversion generally predicts recession for European countries. They determined that yield spread appears to be a chief indicator of recession at the aggregate level; however, its performance varies among individual countries. Risk premia, especially the credit risk factor, distorts the relationship between the yield curve slope and the likelihood of a future recession within EU member countries.

Kumar et al. (2021) analyzed the association between the yield spread and economic activities for G-7 countries based on the data for the period March 1994 to January 2019. The results predicted that there existed a positive relationship between term spread and economic activity for Canada, Germany, UK, USA, France, and Japan. For Italy, a negative association was noted.

In order to analyze the relationship between the yield spread and recession for the US economy, Ajello et al. (2022) identified the economic forces that shape the nominal near-term forward spread (NTFS) dynamics as well as the channels through which NTFS predicts recessions. They highlighted the role of the current stance of both monetary policy and short-term inflation prospects in forecasting downturn. Extensive investigation of its predictive power in terms of spreading for forthcoming activity was previously conducted in 1990s. Additionally, previous studies offered

compelling evidence supporting the use of the yield spread as a predictive tool for a country's economic activity.

However, recent research in this field demonstrates that the relationship between the yield spread and economic growth is not consistently aligned, contrary to what was assumed in previous studies. According to the findings of Haubrich and Dombrosky (1996), the predictive ability of yield spread for economic activity has weakened since the mid-1980s. Estrella et al. (2000) suggested instability in this relationship in the contexts of Germany and the United States of America (USA). Similarly, Zulkhibri and Rani (2016) purported that yield spread provides less information about inflation and future economic output for short spans. Further, the use of yield expansion in monetary analysis beyond predictable indicators remains rather inadequate. Moreover, Siklos (2000) suggested that interest spread is negatively related to future economic expansion in the case of New Zealand for shorter periods of time.

Keeping in view such a situation, it is pertinent to analyze the role of yield spread as a predictor of economic growth for developing countries including Pakistan. Since governments in these countries do not announce the explicit target of economic growth, so the role of interest rate spread has remained ambiguous. Hence, it is crucial to examine the impact of interest spread on economic activity. There is a scarcity of literature on this subject in developing countries. Regarding Pakistan, Hussain and Mahmood (2017) proposed that the yield spread has an impact on inflation and economic growth. They measured the yield spread as the difference between the yield on a 10-year bond and 3-month T-bills in the secondary market. Their findings indicated that the yield spread serves as a reliable indicator of economic expansion in Pakistan, particularly for timeframes ranging from six months to two years.

As yet, there is no study available that analyzes the spread of the yield curve on economic cycles. Hence, this study aims to assess the influence of the yield spread on economic contraction, while incorporating other macroeconomic factors as well, besides keeping insight into economic and social parameters. The first objective of this study is to measure the business cycle of economic growth. To measure contraction and expansion probabilities, Hamilton's (1989) Markov switching model is used. In the subsequent phase, this research examines the impact of the yield spread on economic contractions, taking into account additional macroeconomic

variables, such as migrant workers, foreign direct investment, and the general price level. The data for the period 1980-2020 is analyzed using the Auto Regressive Distributed Lag (ARDL) approach. The findings indicate that the yield spread exhibits a positive correlation with the likelihood of a contraction, contrary to the conventional theory of the yield curve where an increase in the spread signifies economic stability. This study challenges the a priori expectation of the yield curve. These results align closely with the findings of Zulkhibri and Rani (2016), suggesting that the yield spread provides limited evidence regarding the overall direction of the economy. Conversely, control variables, such as migration and foreign direct investment (FDI), reduce the probability of economic contraction. On the contrary, an increase in the price level raises the likelihood of economic contraction.

The subsequent sections of this study are organized as follows: Section 2 deals with the empirical and theoretical framework, as well as the relevant literature regarding the forecasting capability of the yield spread. Section 3 covers the data, methodology, and the econometric model employed in the study. In Section 4, the analysis delves into the trends of the yield curve and contraction, along with the presentation of empirical results. Finally, the last section namely Section 5 concludes the study.

Empirical and Theoretical Background

Sufficient studies and literature regarding the forecasting techniques of future economic output using asset prices is available. In the existing literature to predict future economic growth, an exhaustive analysis is also carried out covering interest rates and particularly term spreads. On account of economic instability in 1970s and early 1980s, the focus remains on forecasting the leading indicators of output growth built on monetary aggregates. The term frequently used in the literature is the difference between the long span, that is, ten-year government bills rate and the short period, that is, three-month treasury bill rate. As such, there is no common method for the estimation of future output. In most of the models, sample estimates are applied. Whereas, in a few cases, some researchers design out-of-sample forecasts.

The relationship between the yield spread and real economic output fundamentally reflects the expectations of financial market participants regarding future economic growth. As a starting point, the relationship

between terms spread and real economic activity may be considered also as a theoretical relationship between macro-economic activity and real interest rate, for example, through investment and consumption. To establish an association between future consumption and the real term structure, a simple optimizing model of consumption can be used to draw a theoretical model.

Research on forecasting in terms of the spread for economic growth was initiated by Stock and Watson (2003), Estrella and Hardouvelis (1991), and Chen (1991). Many researchers found a significant positive relationship between the yield expansion and economic growth. Such conclusions were verified by Bomhoff (1999), Davis and Fagan (1997), and Hamilton and Kim (2000).

Afterwards, research focused on exploring the association between term spread and real economic output which has remained stable over time across the countries. Haubrich and Dombrosky (1996) concluded that the predictive power of the yield expansion for economic growth was curtailed after the 1980s. Similarly, Estrella et al. (2000) suggested that the relationship between the yield spread and economic growth remains unstable for Germany and USA. However, Siklos (2000) presented some opposite findings which showed that yield spread had a negative and significant effect on the future economic growth in New Zealand for the period 1985-1997. He suggested that this negative effect on future economic growth at the short horizon. This is because of the fact that during this period, the government's emphasis was on inflation targeting policy.

The above-mentioned literature leads us to some conclusions. It has been observed that the term expansion can be used as a predictor of economic growth, especially over a short time period. However, the relationship does not remain stable across countries, across periods, and in different monetary policy regimes. Further, the predictive power of the term spread seems to have declined during the last decade. Moreover, limited empirical work supports the results that can be found in Siklos (2000), where the yield spread has a negative relationship with economic growth.

Methodology and Data

Economic Model

The investigation of the impact of yield spread on economic contraction is conducted following the theoretical framework proposed by Estrella and

Hardouvelis (1991). The regression model employed in this study takes the following general form:

$$R_t = \alpha_0 + \alpha_1 spread_t + \sum_{i=1}^{N} \beta_i X_{it} + \varepsilon_t \quad (1)$$

where R_t is the probability of economic contraction, $spread_t$ also measures the slope of the yield curve, and X_{it} is the vector of control variables – migrant workers (M_t), trade openness (TO_t), foreign direct investment (FDI_t), price level (P_t) and wage rate - included in the regression.

Migration from one country to another increases the remittances. This leads not only to improved living standards and decreases the depth and severity of poverty but also boosts the foreign exchange reserves. This, in turn, has the potential to affect a number of other macroeconomic variables, such as it reduces the fiscal deficit and increases the output (Carling, 2005). Similarly, trade openness enhances the output growth of an economy by providing easy access to goods and services. It also enhances total factor productivity by effectively spreading technology, ensuring knowledge transfer, and attaining competency in the allocation of resources (Barro & Sala-i-Martin, 1997; Freund & Bolaky, 2008).

Foreign investment impacts economic growth in many ways. These include increasing business efficiency, stimulating economic growth and business in the receiving country, and increasing the quality and diversity of local manufacturers who are the receivers of capital. Additionally, FDI contributes to knowledge and technology spillover, while also providing training opportunities for the local labor to address future challenges in production and growth (Gory & Greenway, 2004; Bauer, 1991; Easterly, 2006). Furthermore, empirical studies indicate an inverse relationship between inflation and economic activity. For example, Barro (1996) argued that high prices lead to reduced investment levels, which adversely affects output growth and results in economic contraction. Similarly, a surge in the wage rate may stimulate economic growth if it facilitates a shift towards more high-skilled labor, possibly by encouraging additional training for low-skilled workers. Conversely, a reduction in the wage rate can decrease labor productivity, thereby contributing to a contraction in the economy (Lavoie & Stockhammer, 2013; Xu et al., 2015).

Econometric Methodology

The econometric methodology is framed into two parts. The first is to measure the business cycles, date economic contraction and expansion, and measure their probabilities. The second is to model the probabilities of economic contraction with the yield spread and macroeconomic variables that have the potential predictive power for economic contraction.

Economic Contraction Probabilities by Markov Switching Method

The probabilities for economic contraction and expansion are calculated by following the Markov switching model proposed by Hamilton in 1989. It captures the nonlinearity of the process as the process is based on distinct transitions in mean values occurring between the states of high growth and low growth. This is why it is commonly used for the business cycle dating process.

The first-order autoregressive two-state Markov regime-switching model (where only the mean changes) is expressed as follows:

$$y_t = \alpha_{s_t} + \sum_{l=1}^{p} \beta_l y_{t-l} + \varepsilon_t$$

where dependent variable y_t depends on the autoregressive *AR(p)* process, unobserved discrete variable s_t such that $s_t = 1$ for a high-growth state and $s_t = 2$ for a low-growth state, and normally distributed residuals in each regime $\varepsilon_t \sim (0, \sigma_{s_t}^2)$.

s_t exhibits a first-order Markov chain behavior characterized by the transition matrix provided below.

$$\mathbb{P} = \begin{bmatrix} p_{11} = P[s_t = 1 | s_{t-1} = 1] & p_{12} = P[s_t = 2 | s_{t-1} = 1] \\ p_{21} = P[s_t = 1 | s_{t-1} = 2] & p_{22} = P[s_t = 2 | s_{t-1} = 2] \end{bmatrix}$$

Here, p_{ij} $(i, j = 1, 2)$ represents the transition probabilities from $s_{t-1} = i$ $s_t = j$. It is worth noting that the transition probabilities adhere to the condition $p_{i1}+p_{i2} = 1$. To estimate the parameters of the Markov switching autoregressive (MS-AR) model, the maximum likelihood estimator (MLE) is employed.

Utilizing the ARDL Model and Conducting the Bounds Test

The set of regressors in the model are anticipated to be a combination of stationary I(0) and non-stationary I(1) variables. As a result, the regression model (1) is estimated using the ARDL bounds testing approach developed by Pesaran et al. (2001) to examine the long-run (LR) co-integration relationship between the probabilities of economic contraction and their determinants. The ARDL model is presented below.

$$\Delta R_t = \alpha + \sum_{i=1}^{l} ß_{1i}\,\Delta y_{t-i} + \sum_{i=0}^{l} ß_{2i}\,\Delta spread_{t-i} + \sum_{i=0}^{l} ß_{3i}\,\Delta m_{1t-i} + \sum_{i=0}^{l} ß_{4i}\,\Delta to_{t-i} + \sum_{i=0}^{l} ß_{5i}\,\Delta fdi_{t-i} + \sum_{i=0}^{l} ß_{6i}\,\Delta un_{t-i} + \sum_{i=0}^{l} ß_{7i}\,\Delta p_{t-i} + \delta_1 y_{t-1} + \delta_2 spread_{t-1} + \delta_3 m_{t-1} + \delta_4 to_{t-1} + \delta_5 fdi_{t-1} + \delta_6 UN_{4t-1} + \delta_7 p_{t-1} + \varepsilon_t \quad (2)$$

The bounds test aims to observe the existence of cointegration, assuming $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0$. The null hypothesis implies the absence of cointegration among the variables. Conversely, the alternative hypothesis for the cointegrating relationship is $H_A: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq 0$. As per the findings of Pesaran et al. (2001), when the F-test statistic exceeds the upper bound I(1) critical value, the null hypothesis is rejected, providing evidence of a long-run relationship.

Data Description

The empirical analysis is carried out on the annual data for the period 1980-2020. A detailed explanation of the data and data sources is given below in Table 1.

Table 1

Overview of Variables

Symbol	Variables	Description/Measure	Source
		Dependent Variable	
R_t	Economic contraction	The probabilities of economic contraction and expansion is calculated by applying Markov Switching regime technique proposed by Hamilton (1989) on real GDP growth.	The data regarding real GDP growth is sourced from the State Bank of Pakistan (SBP).

Symbol	Variables	Description/Measure	Source
		Independent Variables	
$spread_t$	Yield Spread	It is the difference between the weighted average rates of return on 5-year deposits and the 3-month rates of return[1].	SBP
M_t	Migrant workers	Number of migrant workers	Bureau of Emigration & Overseas Employment
TO_t	Trade openness	Trade openness is calculated as the ratio of the combined value of imports and exports to GDP.	SBP
FDI_t	FDI	FDI refers to a form of investment wherein individuals or organizations from one country invest in companies or assets located in other countries.	SBP
P_t	General price level resumed	The consumer price index is used as a measure of the general price of goods and services based on 2005=100.	SBP
W_t	Wage Level	The average daily wage of construction workers in six major cities of Pakistan, namely Islamabad, Karachi, Lahore, Peshawar, and Quetta are computed.	Pakistan Economics Survey

[1]In the literature, the yield spread is typically determined by subtracting the yield on a 10-year bond from the yield on 3-month T-bills in the secondary market. But Government of Pakistan started the auctions of Pakistan Investment Bonds (PIBs) from December 2000. Due to lack of data we measured the yield spread as a difference between the weighted average rates of return on 5-year deposits and the 3-month rates of return.

Results and Discussion

Economic Contraction Dates and Probabilities by Markov Switching Method

In Hamilton's (1989) two-state Markov regime-switching model, only the mean change is utilized to calculate the smoothed probabilities for both the contraction and expansion regimes. Table 2 demonstrates that the intercept coefficients in both the high-growth and low-growth regimes are highly significant, indicating that these two regimes possess distinct and unique features. As contraction and expansion represent the two extremes of the economy, they exhibit contrasting characteristics. On average, the duration of the expansion phase is approximately 4.07 years, while the contraction phase lasts around 4.93 years. The duration of contraction is longer than expansion which depicts the weakness of the Pakistani economy. It is also expected that the current contraction will end in the period 2023.

Table 2

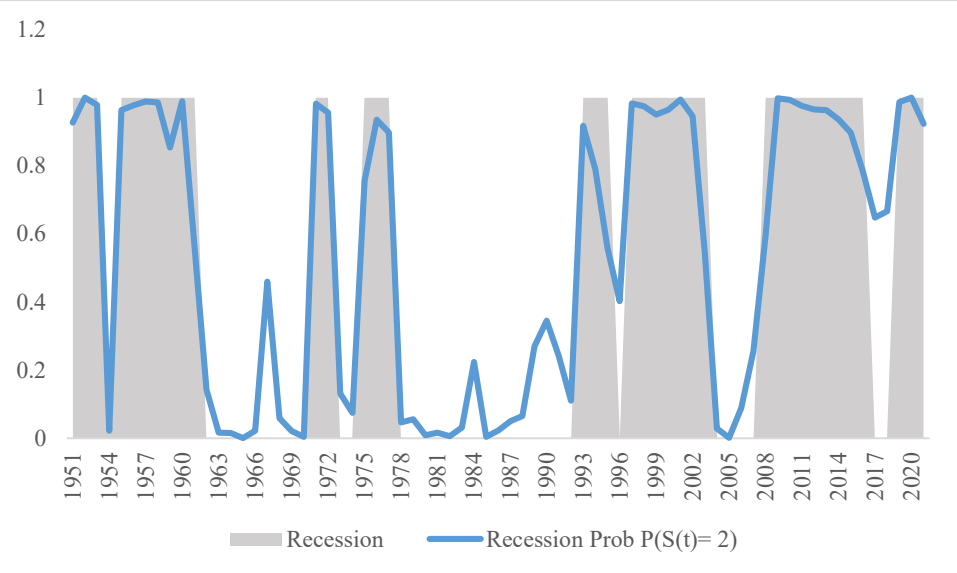
Maximum Likelihood Estimates of Markov Switching Model

Parameters	Coefficients: Regime 1 High growth regime	Coefficients: Regime 2 Low growth regime	Constant Transitional Probabilities	Estimates
α	6.60***	3.18***	p_{11}	0.75
	Common		p_{12}	0.25
LOG(SIGMA)	0.53***		p_{21}	0.20
			p_{22}	0.80
			Constantly expected durations	
			Regime-1	4.07
			Regime-2	4.93
Durbin-Watson stat			2.04	
Akaike info criterion			4.64	

Note. *** Statistically significant at a 1% level, ** Statistically significant at a 5% level, * Statistically significant at a 10% level.

The smoothed regime probabilities of contraction are depicted in Figure 1. The shaded area corresponds to the contraction regime, indicating the high probability of this particular state.

Figure 1
Economic Contraction Probabilities



Drawing upon the smoothed probabilities for expansions and contractions, eight (8) business cycles of Pakistan are identified in Table 2.

Table 2
Business Cycle Dating from Markov Switching

Business Cycle	Contraction	Expansion
First Cycle: 1951-1954	1951-1953	1954
Second Cycle: 1955-1970	1955-1961	1962-1970
Third Cycle: 1971-1974	1971-1972	1973-1974
Fourth Cycle: 1975-1992	1975-1977	1978-1992
Fifth Cycle: 1993-1996	1993-1995	1996
Sixth Cycle:1997-2007	1997-2003	2004-2007
Eight Cycle:2008-2018	2008-2016	2017-2018
Ninth Cycle: 2019-	2019-2021	-

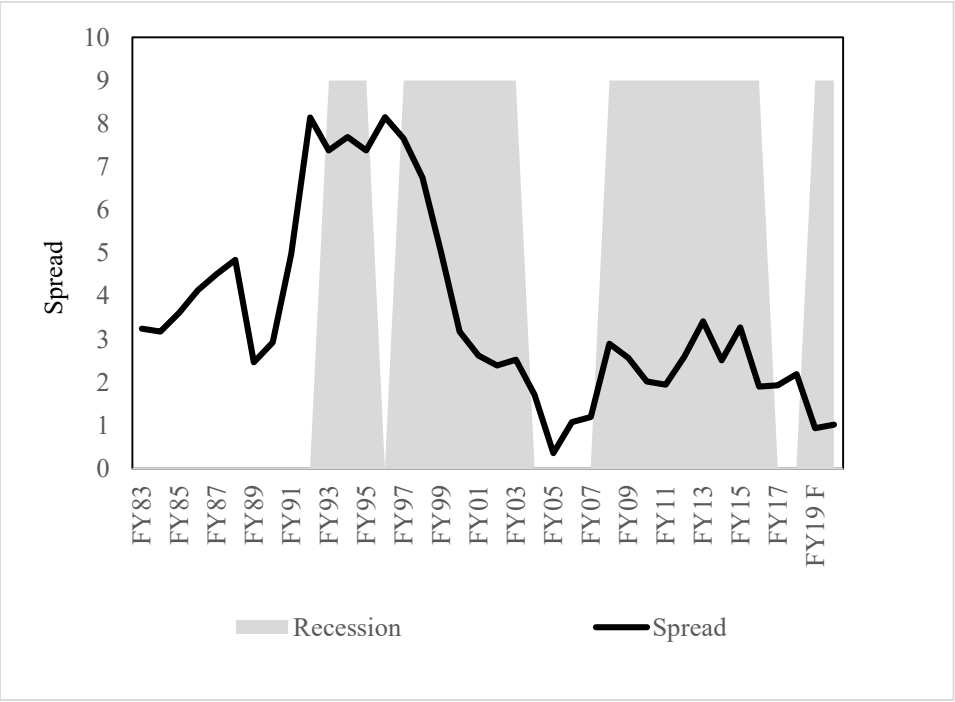
Spread vs Contraction

A rise in the spread is linked with economic expansion and any reduction is linked with economic contraction in the near future. Therefore, the slope of the yield curve becomes negative before economic contraction.

In Figure 2 which depicts spread vs economic contraction, only a single negative spread is notable before the 1994 to 2006 economic contraction.

Figure 2

Spread vs Economic Contraction



Continuous Model of Economic Contraction

Unit Root Testing

In order to estimate the continuous regression model linking the yield spread to economic contraction using the ARDL bounds test approach, it is crucial to ensure that there are no non-stationary variables at the second difference level, denoted as I(2). If I(2) variables are present, the bounds test of cointegration by Pesaran et al. (2001) is no longer applicable. The results of the Augmented Dickey-Fuller (ADF) test can be found in Table 3. According to the ADF unit root test, all variables exhibit an integration of order one, indicating that they are stationary at the first difference level.

Table 3
Analysis of Stationarity

Variables	At level				At first difference				Conclusion
	t_{cal}	t_{tab}	c, t	lag	t_{cal}	t_{tab}	c, t	Lag	
R_t	-1.86 (0.35)	-2.94	C	0	-5.64 (0.00)	-1.95	-	0	1(1)
$spread_t$	-0.91 (0.32)	-1.95	-	0	-5.36 (0.00)	-1.95	-	0	1(1)
$m_t = lnM_t$	-1.33 (0.61)	-2.94	C	0	-5.04 (0.00)	-1.95	-	0	1(1)
$to_t = lnTO_t$	-2.18 (0.22)	-2.94	C	0	-6.71 (0.00)	-1.95	-	0	1(1)
$fdi_t = lnFDI_t$	-2.31 (0.38)	-3.52	c,t	0	-7.37 (0.00)	-2.93	c	0	1(1)
$p_t = lnP_t$	-0.29 (0.97)	-2.94	C	6	-5.71 (0.00)	-2.94	c	5	1(1)
$w_t = lnW_t$	-2.36 (0.40)	-3.52	C, t	0	-6.00 (0.00)	-2.94	c	0	1(1)

Cointegration Analysis using ARDL Bounds Tests

To examine the long-term associations and short-term dynamic interactions among the variables of interest (economic contraction probabilities, spread, migrant workers, trade openness, foreign direct investment, unemployment rate, and general price level), the ARDL cointegration technique is applied. It begins with the general model which contains a maximum of two lags for each variable. By testing down and dropping insignificant terms, the selected model for ARDL is (2, 1, 2, 0, 2, 1, 0). With this specification, there is no evidence of autocorrelation ($\chi^{2}_{(1)} = 1.83$ with prob. 0.175), no ARCH effect ($\chi^{2}_{(1)} = 0.52$ with Prob. 0.471), and residuals are normally distributed (Jarque-Bera 6.19 with prob. 0.05) at 5% level of significance. From the bounds test results reported in Table 4, the presence of cointegration between the variables becomes evident, as indicated by the F-statistic (5.54) surpassing the upper-bound critical value (3.28) at 5% significance level. Therefore, the null hypothesis of no cointegration between the variables is rejected.

Table 4
Bounds Test Results

	F- Statistic	Decision
$F_R(R_t \mid spread_t, m_t, to_t, fdi_t, p_t, w_t)$	5.54	Cointegration
Lower-bound critical value at 5%	2.27	
Upper-bound critical value at 5%	3.28	

The critical values used are sourced from Pesaran et al. (2001), specifically Table CI(ii) Case II.

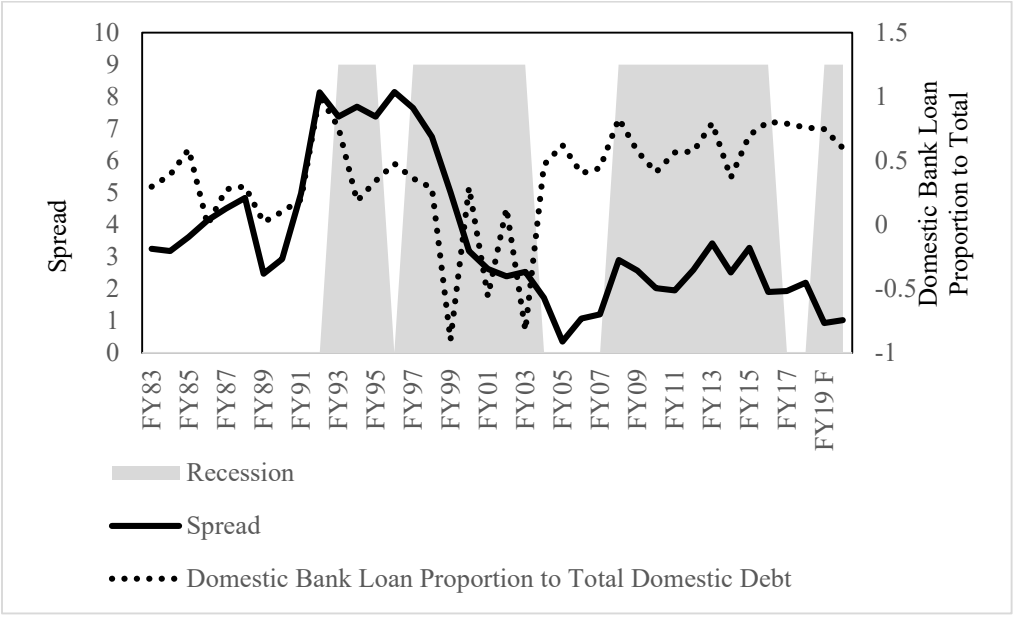
The long-run results obtained from ARDL (2, 1, 2, 0, 2, 1, 0) by normalizing R_t are presented in Table 5. The calculated coefficients of the log-run relationship demonstrate statistical significance in relation to the spread, migrant workers, foreign direct investment, and general price level, although the coefficients remain insignificant for trade openness and wages. The spread is positively associated with the probability of economic contraction[2] (the effect of spread on economic contraction was also confirmed by estimating the discrete model of economic contraction, see appendix for details). This result contrasts with the general theory of yield curve, where an increase in the spread is an indicator of economic stability. However, this result is very similar to Zulkhibri and Rani (2016). Accordingly, yield spread contains little confirmation on the direction of the overall economy. In this case, an increase in the spread indicates economic contraction. Therefore, whenever there is an increase in the spread, economic contraction rather than growth should be expected. It also highlights the fact that savings from deposits are not used for investment purposes. This motivates one possible explanation of the positive association between spread and economic contraction, which is the high level of government debt borrowing[3] to finance budget deficit. Although deficit financing is necessary in during economic contraction, still it has long-term consequences, such as it reduces the spending on investment. Consequently, public debt from the domestic market crowds out the private sector and may decrease the future potential output of the economy. Banks also prefer to lend/invest their money to the government which is risk-free.

[2] Perhaps this may be due to different measure of spread, see footnote 1.
[3] Government domestic debt is typically acquired by issuing short-term and long-term government securities, such as treasury bills, which are sold to domestic banks and financial institutions.

This makes it difficult for private businesses to secure a loan. It is also evident from Figure 3 that domestic debt from the bank increases with the increase in the spread, which is alarming and indicates institutional problems. As the government incurs interest on domestic debt, an increase in interest rate leads to higher payments on short-term debts and also on long-term debts that mature early. In order to fulfill these obligations, the government may need to raise taxes and eliminate subsidies, resulting in an upward pressure on price levels instead of a decline (Rahman, 2021).

Figure 3

Spread vs Domestic Bank Loan



Moreover, the control variable namely migration has a positive role in increasing economic growth and reducing economic contraction. These results are consistent with the studies of Ratha et al. (2010), Gupta et al. (2009), and Anyanwu and Erhijakpor, 2010). Regarding the impact of trade openness, it has a negative sign with the probability of economic contraction but remains statistically insignificant. This is in line with the study of Kim (2011) that trade openness is favorable to output growth for low-inflation countries but seems to have an insignificant effect on output in high-inflation countries.

The influx of foreign capital plays a pivotal role in fostering economic growth. The findings align with the established economic theory, demonstrating that FDI has a negative and significant impact on economic contraction with a coefficient magnitude of 0.17. This outcome is in line with both the endogenous theory (Romer, 1986) and the innovation-based growth model (Grossman & Helpman, 1994). Thus, FDI spillover contributes to bolstering the Pakistani economy.

Table 5
Long-run Coefficients

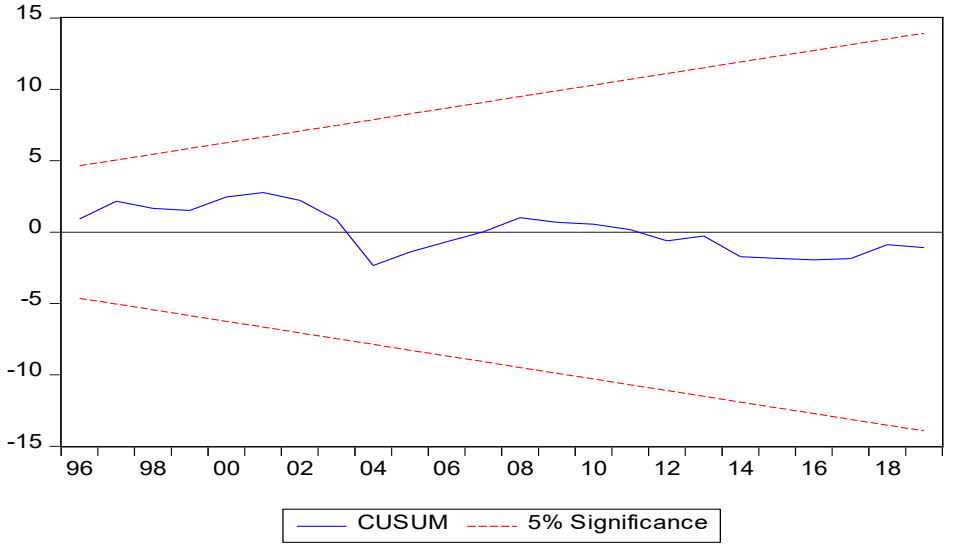
Variables	Coefficient	*t*-stat	Prob.
$spread_t$	0.07	4.20***	0.001
m_t	-0.22	-1.76*	0.090
to_t	-0.70	-1.55	0.134
fdi_t	-0.17	-2.43**	0.023
p_t	1.09	2.63***	0.015
w_t	-0.26	-0.71	0.483
C	3.69	1.93*	0.066

Similarly, the results show that an increase in the price level causes economic contraction and the magnitude of the coefficient is 1.09. The result supports the studies of (Fischer, 1993; Barro, 1996) which explained that inflation affects economic growth by reducing investment and productivity. Moreover, an increase in price level reduces the purchasing power of the people, since they are forced to stretch their paychecks which of course has limits. Wages have a negative relationship with economic contraction but remain statistically insignificant. A wage-led strategy is a worthwhile economic policy for worldwide economic growth. An increase in the wage rate has a favorable impact that goes beyond aggregate demand and economic activity. Moreover, an increase in wages also induces positive effects on the growth rate by enhancing labor productivity. Short-run dynamic parameters of the continuous economic contraction model are estimated through the Error Correction Model (ECM) which is related to the long-run estimates. The ECM regression is presented in Table 6. It can be seen from the results that migrant workers, foreign direct investment, and general price level are the true determinants of economic contraction in the short-run, rather than the spread.

Table 6
Error Correction Model (ECM)

Variables	Coefficient	t-stat	Prob.
ΔR_{t-1}	0.36	3.11***	0.005
$\Delta spread_t$	-0.01	-0.20	0.844
Δm_t	0.01	0.06	0.951
Δm_{t-1}	0.27	2.85***	0.009
Δfdi_t	-0.11	-2.25**	0.034
Δfdi_{t-1}	-0.11	-2.09**	0.047
Δp_t	2.99	7.51***	0.001
ECM_{t-1}	-0.71	-7.57***	0.001
F-statistic (Prob)	16.57 (0.00)		
Ramsey RESER Test	3.37 (0.08)		

Figure 4
A Plot of CUSUM Test



To sum up the discussion, the findings reveal a significantly positive association between the spread and economic contraction, which contradicts the conclusions drawn by Estrella and Mishkin (1997) and Stock and Watson (2003). However, the results align with the empirical evidence put forth by Siklos (2000). Siklos suggested that the interest rate spread has a negative and significant impact on short-term economic growth,

particularly in the context of New Zealand's inflation targeting period. Therefore, it can be inferred that the relationship between the yield spread and future economic activity of a region is likely influenced by the prevailing monetary policy framework and the monetary authority's responsiveness to inflation and output. Overall, it can be concluded that the term spread is more effective in predicting output growth when the monetary regime prioritizes output responsiveness over strict inflation targeting and when inflation displays relative persistence (Wheelock & Wohar, 2009).

Moreover, the government borrows loans from the banks to finance its budget deficit which causes yield spread to increase. However, debt financing by the government has negative consequences in the long-term. This is because private investors are crowded out due to the high-interest rates imposed by the banks. So, this scenario ultimately leads to economic contraction. The results prove that specific control variables namely promoting migration, foreign direct investment, trade openness, and enhancing wage rate help to reduce economic contraction, while increasing the price level leads to contraction in the economy.

Conclusion

This study aimed to analyze the effect of yield spread on the probability of economic contraction in Pakistan. Previous empirical studies mainly focused on developed economies, with limited consideration given to developing countries. Consequently, in order to consider the impact of yield spread on Pakistan's economic cycles, the data for the period 1980-2020 was utilized, employing the ARDL approach to account for the varying orders of integration among the variables. Additionally, E CM was employed to assess the long-run and short-run relationships between yield spread and economic contraction.

The findings revealed a significantly positive association between the spread and economic contraction. Furthermore, the government's practice of borrowing loans from banks to cover its budget deficit contributes to an expanding yield spread. Nevertheless, long-term consequences of government debt financing include the displacement of private investors due to the elevated interest rates set by banks, ultimately ending in economic contraction. Positive outcomes are observed when control variables such as stimulating migration, foreign direct investment, trade openness, and

raising wage rates are implemented, effectively mitigating economic contraction. Conversely, a rise in the price level is found to induce economic contraction.

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Appendix

Discrete Model of economic contraction

In the context of binary time series analysis, the dependent variable Rt = 1, 2, ..., T represents a observed outcomes derived from a stochastic process that can only assume values of 1 or 0. When it comes to predicting economic contractions, the value of a binary economic contraction indicator is contingent upon the prevailing state of the economy, such as

$$R_t = \begin{cases} 1 \; if \; the \; economy \; is \; in \; contractionary \; state \; at \; time \; t \\ 0 \; if \; the \; economy \; is \; in \; expansionary \; state \; at \; time \; t \end{cases}$$

The binary variable R_t is connected to the yield curve through the subsequent regression equation:

$$R_t = \alpha_0 + \alpha_1 spread_t + \sum_{i=1}^{N} \beta_i X_{it} + \varepsilon_t$$

the conditional probability of an economic contraction at time t is

$$P(R_t \geq 0 | spread_t, X_{it}, \alpha, \beta \;) = \Phi \left[\alpha_0 + \alpha_1 spread_t + \sum_{i=1}^{N} \beta_i X_{it} \right]$$

The results of the discrete model of economic contraction are as follow

Dependent Variable: Economic contraction				
Independent Variable	Coefficient	SE	z-Statistic	Prob.
SPREAD	0.532782	0.182842	2.913894	0.0036
LNMIG	0.742429	0.957212	0.775616	0.4380
LNTO	-10.68383	4.727030	-2.260157	0.0238
LNFDI	0.355744	0.486956	0.730547	0.4651
LNCPI	-0.155260	1.404805	-0.110520	0.9120
C	23.14350	14.18679	1.631341	0.1028
McFadden *R*-squared	0.520617			
Observations with Dep=0	21	Total observations		41
Observations with Dep=1	20			