Research Article/Araştırma Makalesi

Exchange Rate Regimes and Business Cycles

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Abstract

This study investigates the effect of exchange rate regimes (ERRs) on classical business cycles in advanced (AE) and emerging market and developing economies (EMDE). Considering the difference between words and deeds of the monetary authorities, we use the *de facto* ERR classification. Our logit and probit estimation results indicate that, in AE, the probability of expansion rises with ERR flexibility as compared to pegged ERR. In EMDE, the expansion probability increases with limited flexibility ERR while diminishes with managed and freely floating ERRs. We also find that worsening (favorable) global financial cycle increases recession (expansion) probability during the post-globalization period.

Key Words:: *Business cycles, Exchange rate regimes, Advanced economies, Emerging market and developing economies, Panel data*

JEL Codes: *C35, E32, F33*

Döviz Kuru Rejimleri ve İş Çevrimleri

Öz

Bu çalışma, gelişmiş (GÜ) ve yükselen piyasa ve gelişmekte olan ülkelerde (YPGÜ) uygulanan döviz kuru rejimlerinin (DKR) iş çevrimleri üzerindeki etkisini incelemektedir. Para otoritelerinin söylemleri ile eylemleri arasındaki farkı dikkate alarak, ülkelerin gerçekte uyguladıkları DKR sınıflandırması kullanılmıştır. Logit ve probit tahmin sonuçlarımız, sabit DKR'ne kıyasla, GÜ'lerde genişleme olasılığının DKR esnekliği arttıkça arttığını göstermektedir. YPGÜ'lerde genişleme olasılığı, sınırlı esnek DKR ile artarken, yönetilebilir ve serbest dalgalanan DKR ile azalmaktadır. Ayrıca, küreselleşme sonrası dönemde olumsuz (olumlu) küresel finansal döngünün daralma (genişleme) olasılığını artırdığı bulgusuna ulaşılmıştır.

Anahtar Kelimeler: *İş Çevrimleri, Döviz kuru rejimleri, Gelişmiş ekonomiler, Yükselen piyasa ve gelişmekte olan ekonomiler, Panel veri*

JEL Kodları: *C35, E32, F33*

1. Introduction

Does the prevailing exchange rate regime (ERR) matter for macroeconomic variables and business cycles? The seminal study by Baxter and Stockman (1989) suggests that flexible ERR tends to increase the volatility of real exchange rates, albeit the volatility of macroeconomic variables is almost the same. This surprising result leads most of the studies to investigate the impact of ERR on macroeconomic variables. According to Ghosh et al. (2002), intermediate ERR leads to higher growth. Levy-Yeyati and Sturzenegger (2003), on the other hand, find that floating ERR boosts growth. The empirical findings by Rose (2011) suggest that the effect of ERR on growth is negligible. The literature, unfortunately, provides inconclusive evidence on the growth impact of ERR. Furthermore, many studies tend to ignore the effect of prevailing ERR on business cycles.

In this paper, we examine the relationship between ERR and business cycles in advanced and emerging market and developing economies. Considering different ERRs have different properties, we maintain that business cycles can be affected by the prevailing ERR. For instance, fixed ERR provides credibility and insulation from nominal shocks, reduces uncertainty and transaction costs as indicated by Ghosh et al. (2002). Frankel (2012) remarks that flexible ERR provides independence in macroeconomic policies and insulation from external shocks, allows the central banks to maintain seigniorage return and prevents the speculative bubbles.

To investigate the effect of ERR on business cycles, we consider the business cycle definition suggested by Burns and Mitchell (1946). Considering the divergence between words and deeds of the monetary authorities, we use the *de facto* (actually followed) ERR classification provided by Ilzetzki et al. (2021). According to this classification, ERR consists of hard pegs (ERR1), limited flexibility (ERR2), managed floating (ERR3), freely floating (ERR4), freely falling (ERR5) and dual markets in which parallel market data is missing (ERR6) categories. Reinhart and Rogoff (2004) and Ilzetzki et al. (2021) remark that freely falling ERR contains inflationary periods, currency crashes and lack of monetary control. Therefore, we exclude ERR5 and ERR6 in our analysis. Ilzetzki et al. (2021) indicates that higher ERR categories up to ERR4 represent more flexible ERRs.

To explain the relationship between ERR and business cycles, we control the effect of global financial cycle (GFC) which is one of the most important indicators of business cycles as suggested by Davis et al. (2019). Miranda-Agrippino and Rey (2022) remark that the GFC tends to affect domestic macroeconomic and financial conditions. For instance, favorable global financial conditions represent the risk-on episodes leading to movement of capital to emerging market and developing economies. Worsening global financial conditions, on the other hand, show the risk-off episodes promoting the movement of capital to advanced economies due to flight to safety concerns. In this vein, favorable or worsening GFC can affect the business cycle by loosening or tightening credit constraints.

Our logit and probit estimation results suggest that the prevailing ERR affects the probability of expansions both in advanced and emerging market and developing economies. As compared to the pegged ERR, limited flexibility and freely floating ERRs tend to increase the expansion probability in advanced economies, albeit this is much higher for the latter. In comparison to pegged ERR, the probability of expansions increases with limited flexibility regime whilst diminishes with managed and freely floating ERRs in our sample of emerging market and developing economies. These empirical results are almost the same during the pre- and post-globalization periods. Also, favorable global financial conditions tend to increase the probability of business cycle expansions in both samples during the post-globalization period.

The structure of this paper is planned as follows. A brief literature review is provided in Section 2. Section 3 provides some key stylized facts on business cycles and exchange rate regimes. Section 4 provides the logistic and probit estimation results. Section 5 concludes the paper.

2. A Brief Literature Review

Cruz-Rodriguez (2013) provides a brief literature review on exchange rate regime choice by dividing the studies into classical and modern theories. The classical view maintains that ERR choice is mainly determined by the relative incidence of nominal/real shocks. In this vein, floating and fixed ERRs, respectively, provide insulation from real and nominal shocks (Mundell, 1963). The modern view, on the other hand, focuses on the comparison of ERR based on credibility vs. flexibility and economic performance vs. crisis. Accordingly, fixed ERR provides credibility (Dornbusch, 2001), albeit it prones to crisis[1] (Obstfeld and Rogoff, 1995). Flexible ERR allows the countries to implement independent monetary policy (Giavazzi and Pagano, 1988) and provides better macroeconomic performance (Edwards and Levy-Yeyati, 2005).

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[1]   Tavlas et al. (2008) note that intermediate ERR prevailing economies have experienced substantial exchange rate crisis during the 1990s. This has led to the emergence of the bipolar hypothesis. Frankel (2003) dubbed this as "the hypothesis of vanishing-middle regime". Accordingly, financially more open economies implement either floating or pegged ERR because the probability of exchange rate crisis is much higher in intermediate ERR. Fischer (2001) states the "two corners" debate by indicating pegged ERR provides credibility and macroeconomic stability whilst floating ERR provides a room for maneuver from the external shocks.

Dornbusch (1992) and Frankel (2012) note that the choice of fixed vs. flexible ERR depends also on the size of the economies, openness and financial development levels. In this context, Frankel (2012) remarks that fixed ERRs tend to provide more benefits to small, less open and financially less developed economies. Fiess and Shankar (2009) suggest that deterioration in debt levels, higher liabilities, volatile stock market and low growth rates led the countries to switch away from fixed ERR. Dornbusch (1992) states that openness to international capital flows promotes the implementation of more flexible ERR.

Husain et al. (2005) and Reinhart and Rogoff (2009) report that macroeconomic performance of emerging market economies is invariant to the ERR whilst flexible ERR increases growth in advanced economies. Levy-Yeyati and Sturzenegger (2003), on the other hand, find that fixed ERR leads to lower growth in developing economies while the impact of ERR on growth is insignificant in developed economies. Fixed ERR prevailing developing economies tend to experience volatile (Levy-Yeyati and Sturzenegger, 2005) and lower growth (Bleaney and Francisco, 2007), while flexible ERR tends to increase growth (Edwards and Levy-Yeyati, 2005). There is no direct impact of ERR on long-term growth in developing economies according to the findings by De Vita and Kyaw (2011).

It is conventionally argued that pegged ERR has a crucial importance in the transmission of shocks across countries. In this context, Artis and Zhang (1996) and Hou and Knaze (2022) report that participation into the currency union stimulates the transmission of business cycles. Lee and Shin (2010) find that pegged ERR tends to enhance income synchronization between countries. Elgahry (2022) shows that flexible ERR appears to weaken the business cycle synchronization during the recession periods. Erdem and Özmen (2015) find that expansion probability raises with ERR flexibility in advanced and emerging market economies.

The literature often maintains that monetary, fiscal and oil price shocks lead to business cycle fluctuations (Rebelo, 2005). Investment shocks (Justiniano et al., 2010), labor supply shocks (Shapiro and Watson, 1988) and shocks to trend growth (Aguiar and Gopinath, 2007) are also important determinants of business cycles. Neumeyer and Perri (2005) report that real interest rates are countercyclical in emerging market economies, albeit they are acyclical in advanced economies. Jorda et al. (2019) show that US monetary policy tends to affect the risk premium both in fixed and floating ERRs, albeit this is much higher for the former. Higher risk premiums operate as a negative demand shock causing the investors to mitigate their investments. Considering interest rate which is the main component of risk premium, the rise in risk premium also lead to higher debt to GDP ratio during the recessions.

The empirical finding by Kose et al. (2003) suggests the existence of the world business cycle. Kose et al. (2012) find that there is business cycle convergence within the samples of advanced and emerging market economies. Karadimitropoulou (2018) reports that the business cycles of emerging market economies are much more synchronized with the world business cycle. Nolan and Thoenissen (2009) find that financial shock is much more im-

portant than total factor productivity and monetary shocks for business cycles. The results by Jordà et al. (2017) imply that business cycles are more correlated with financial variables. Ludvingson et al. (2021) report that financial uncertainty is one of the most important drivers of business cycle fluctuations.

Miranda-Agrippino and Rey (2022) suggest that a high level of interconnectedness in the movements of risky asset prices, capital flows, leverage and financial aggregates has led to the occurrence of global financial cycle (GFC). The global financial cycle (GFC) is one of the most important drivers of business cycles as indicated by Davis et al. (2019). Obstfeld et al. (2018) indicate that the transmission of GFC on domestic financial conditions and output is much higher in emerging market economies with fixed ERR. Motivated by the above reviewed literature, this paper aims to provide a contribution to the literature by investigating the relationship between exchange rate regimes and business cycles after taking into account the effect of GFC for the samples of advanced and emerging market and developing economies.

3. Business Cycles and Exchange Rate Regimes: Some Key Stylized Facts

The business cycle analysis of the National Bureau of Economic Research has been explained in detail by Burns and Mitchell (1946). Accordingly, the business cycle is a pattern in real GDP series to show the "aggregate economic activity". The first step of business cycle analysis is to identify the cyclical peak and trough dates for a variable of interest as indicated by Bry and Boschan (1971). As consistent with the National Bureau of Economic Research analysis, we combine the phases of trough-to-peak as expansion and the phases of peak-to-trough as contraction. Bry and Boschan (1971) remark that business cycle analysis should be based on the seasonally adjusted series. Harding and Pagan (2002) introduce the Bry and Boschan quarterly (BBQ) algorithm built upon the methodology in Bry and Boschan (1971). BBQ algorithm finds that a local peak occurs in seasonally adjusted series with logarithmic form at time t if $y_t > y_{t \pm k}$, where k is the minimum duration of a phase. In a similar vein, a local trough in seasonally adjusted series with logarithmic form occurs if $y_t < y_{t \pm k}$. Consistent with Bry and Boschan (1971), BBQ algorithm maintains that the minimum duration of phase (k) is two quarters, and a complete cycle continues at least five quarters.

The key characteristics of traditional business cycles can be succinctly described as their duration, amplitude, slope and the cumulative effects. The span of quarters (k) separating a peak from the subsequent trough in actual GDP corresponds to the duration of a recession. Similarly, the number of k between a trough and the subsequent peak in real GDP indicates duration of an expansion. The change in y_t from peak to the next through represents the amplitude of a recession. Similarly, the change in y_t from through to the next peak shows the amplitude of an expansion. The slope or speed of a cyclical phase is calculated by the division of amplitude over duration. The cumulative effect of a phase is computed as:

where the subindices j and 0 show, respectively, the end and beginning of the phase, A_p shows the amplitude and F_p is the cumulative gains (costs) in expansion (recession) episodes.

Table 1 reports the key properties of the classical business cycles in advanced and emerging market and developing economies. We disaggregate our sample as advanced (AE) and emerging market and developing economies (EMDE) according to the Morgan Stanley Capital International Index country classification. In the appendix, Table A1 reports the countries in our sample and the time period. Considering the remarks by Bry and Boschan (1971), we use the seasonally adjusted real GDP data to identify the expansion and contraction episodes. We obtain the data from International Financial Statistics, IMF; Quarterly National Accounts, OECD and Global VAR database provided by Mohaddes and Raissi (2020).

According to Table 1, the average duration of contractions is almost 4 quarters both in AE and EMDE. The average duration of expansions is about 23 quarters in both country samples. As compared to the average duration of contractions, the average duration of expansions is much higher in AE and EMDE. Despite the similarity in terms of average duration of expansions and contractions, AE and EMDE country groupings are differentiated from each other in terms of the amplitude, slope and cumulative effects of contractions and expansions.

Table 1: The Main Properties of Classical Business Cycles

|	Contractions				Expansions			
	Duration	Amplitude	Slope	Cost	Duration	Amplitude	Slope	Gain
AE								
Average	4.09	-6.34	-1.55	-19.67	23.19	27.5	1.19	541.45
Median	3.94	-4.92	-1.25	-12.46	19.87	23.6	1.19	291.79
EMDE								
Average	4.38	-12.8	-2.92	-38.99	23.89	54.5	2.28	938.57
Median	4	-12.3	-3.08	-34.91	21	51.9	2.47	623.01

The average amplitude of contractions is -6.34% in AE and -12.8% in EMDE. The mean amplitude of expansions is 27.5% in AE and 54.5% in EMDE. As compared to AE, the average amplitude of expansions and contractions is much higher in the sample of EMDE. In other words, recessions are deeper, and expansions are steeper.

The average slope of contractions is -1.6% in AE and -2.9% in EMDE. The mean slope of expansions is 1.2% in AE and 2.3% in EMDE. In comparison to AE, EMDE tends to experience rapid expansions and contractions. The cumulative effect of contractions is nearly -20% in AE and -39% in EMDE. The cumulative effect of expansions is 541.5% in AE and 938.6% in EMDE. The cumulative effects of both contractions and expansions are much higher in EMDE. The main features of classical business cycles in Table 1 indicate that the

impacts of expansions and contractions are different in EMDE and AE country groupings, albeit they are similar in terms of the duration of expansions and contractions.

To investigate the effect of ERR on business cycles, we consider the *de facto* ERR classification. Considering the divergence between the words and deeds of the monetary authorities, the empirical results based on *de facto* measure are more reliable. The literature provides three different *de facto* ERR classifications constructed by Levy-Yeyati and Sturzenegger (2022), Shambaugh (2004) and Ilzetzki et al. (2021). Levy-Yeyati and Sturzenegger (2022) classify the ERR as float, intermediate and fix based on the movements in exchange rates and reserves utilizing clustering method. Shambaugh (2004) classifies the ERR as pegged and non-pegged ERR by considering the officially declared exchange rate remains within a small band for a long period. Ilzetzki et al. (2021) classifies ERR as hard pegs (ERR1), limited flexibility (ERR2), managed floating (ERR3), freely floating (ERR4), freely falling (ERR5) and dual market in which parallel market data is missing (ERR6) categories based on the movements in exchange rates. Amongst these classifications, the monthly ERR data are only available in Ilzetzki et al. (2021) classification. Therefore, we consider Ilzetzki et al. (2021) ERR classification. Considering the remarks by Reinhart and Rogoff (2004), we exclude the observations that belong to the ERR5 and ERR6 categories. Within the 1-4 scale ERR classification, higher numbers represent more flexible ERR.

Figure 1: The Evolution of Exchange Rate Regimes

Figure 1. Emerging Market and Developing Economies
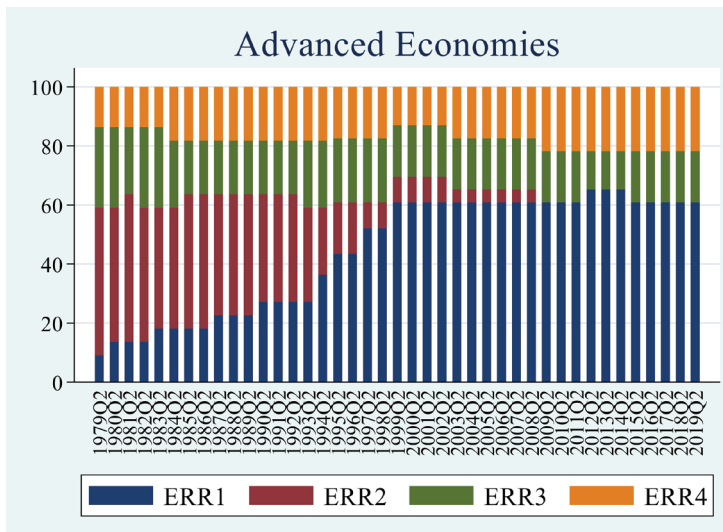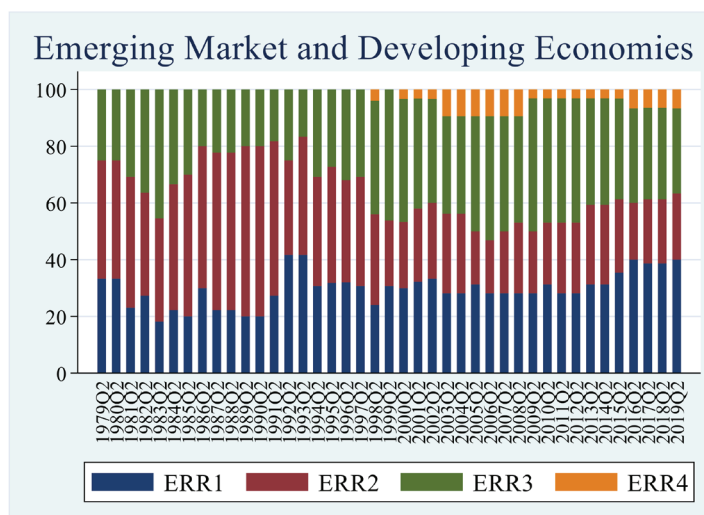
According to Figure 1, almost 60 percent of the observations belong to the managed ERR (hard pegs and limited flexibility) episodes in AE. Towards the end of the 1990s, ERR1 prevailing observations have been increased in the sample of AE. This may not be surprising because most of the countries in AE are involved in the Eurosystem[2] by replacing their national currencies with the Euro. EMDE, on the other hand, tends to prevail more managed ERRs (hard pegs and limited flexibility) until the half of the 1990s and then begins to implement more floating ERR (managed and freely floating).

To explain the ERR-business cycle relationship, we consider the effect of global financial cycle (GFC) which is one of the most important drivers of business cycles as indicated by Davis et al. (2019). The GFC represents the risk on/off periods calculated based on the risky asset prices, commodity prices (except precious metals) and corporate bond indices using dynamic factor model. Accordingly, favorable GFC indicates the risk on periods leading to movement of capital to emerging market and developing economies while worsening GFC represents the risk off episodes promoting the movement of capital to advanced economies due to flight to safety concerns. The monthly GFC data are available during the 1980-January: 2019-April and taken from Miranda-Agrippino and Rey (2022). To employ BBQ procedure, we transform the monthly HP-filtered GFC data into quarterly data by calculating three-month averages. We define the phases of through to peak (peak to through) in GFC as favorable (worsening) global financial conditions. The average duration of favorable and worsening GFC is, respectively, 16.5 and 20.8 quarters. The average amplitude of both favorable and worsening GFC is 1.8%. The speed of favorable GFC is 0.11% while the slope of worsening GFC is 0.09%. All these may indicate that the business

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2   The members of the Eurosystem (their join dates) are Austria (1999), Belgium (1999), Finland (1999), France (1999), Germany (1999), Ireland (1999), Italy (1999), Luxembourg (1999), the Netherlands (1999), Portugal (1999), Spain (1999), Greece (2001) and Cyprus (2008).

cycle properties of favorable and worsening GFC are almost the same in terms of duration, amplitude and slope.

4. Empirical Methodology and Results

To investigate the impact of prevailing ERR on classical business cycles, we consider the following equation:

$$D\_BC_{it} = \alpha_0 + \beta_0 ERR2_{it} + \beta_1 ERR3_{it} + \beta_2 ERR4_{it} + \beta_3 D\_GFC_t + \alpha_i + \alpha_t + u_{it} \ (1)$$

In eq. (1), i represents the countries and t denotes the years. D_BC is a dummy variable that shows the phase of business cycles. For instance, D_BC is 1 for the expansion episodes and 0 for the contraction periods. ERR2, ERR3 and ERR4 are also dummy variables constructed based on *de facto* ERR classification by Ilzetzki et al. (2021). ERR2, ERR3 and ERR4 are 1, respectively, for the limited flexibility, managed and freely floating ERR and 0 otherwise. The estimated parameters in Eq. (1) measure the performance of limited flexibility, managed floating and freely floating ERR relative to the excluded pegged ERR. Considering the remarks by Davis et al. (2019), we also include global financial cycle (GFC) in our estimates. In eq. (1), D_GFC is a dummy variable that takes the value 1 for the favorable GFC periods and 0 otherwise. We include time dummies to consider the impact of global income fluctuations. Also, we include country-specific fixed effects to count the time-invariant impacts in our estimates. We estimate Eq. (1) by employing logit estimation procedure.

Table 2 reports the estimation results. In the whole sample, the estimated coefficient for ERR2 is positive and statistically significant. This suggests that expansion probability increases with limited flexibility regime (ERR2) as compared to the pegged ERR (ERR1). The associated marginal effect shows that, compared to the pegged ERR, the probability of expansions is higher by 12.2 percentage points for the economies with limited flexibility ERR. In comparison to pegged ERR, the impact of managed floating regime (ERR3) on the probability of expansions is positive but statistically insignificant. This implies that the performance of managed floating ERR is not significantly different from that of the pegged regime. As compared to pegged ERR, freely floating ERR (ERR4) tends to increase the probability of expansions. The corresponding marginal effect indicates that the probability of expansions is higher by 16.4 percentage points in freely floating ERR observations than pegged ERR episodes. There is a positive and significant association between global financial conditions (GFC) and business cycles. Accordingly, favorable (worsening) GFC tends to increase the probability of expansions (recessions). In terms of predicted probabilities, almost 81 percent of the observations tend to experience expansionary episodes.

Table 2: Logit Estimation Results for Eq. (1)

	Whole Sample			Advanced Economies			Emerging Market and Developing Economies		
	Estimated parameters	Marginal Effects	Odd ratios	Estimated parameters	Marginal Effects	Odd ratios	Estimated parameters	Marginal Effects	Odd ratios
$ERR2_{it}$	0.855***	0.122***	2.351***	0.827***	0.083***	2.285***	0.580***	0.096***	1.787***
	(0.145)	(0.020)	(0.341)	(0.251)	(0.025)	(0.575)	(0.199)	(0.032)	(0.355)
$ERR3_{it}$	0.219	0.031	1.245	0.063	0.006	1.065	-0.332*	-0.055*	0.717*
	(0.150)	(0.021)	(0.187)	(0.394)	(0.039)	(0.420)	(0.196)	(0.032)	(0.140)
$ERR4_{it}$	1.145***	0.164***	3.142***	2.338***	0.234***	10.359***	-0.590*	-0.097*	0.554*
	(0.211)	(0.030)	(0.662)	(0.345)	(0.033)	(3.574)	(0.347)	(0.057)	(0.193)
D_GFC_t	1.381**	0.198**	3.977**	1.517	0.152	4.560	1.104*	0.182*	0.554*
	(0.665)	(0.095)	(2.646)	(1.507)	(0.150)	(6.870)	(0.520)	(0.107)	(0.193)
Constant	-3.218***		0.040***	-10.260***		0.001***	-2.061***		0.127***
	(0.622)		(0.025)	(1.513)		(0.000)	(0.622)		(0.079)
Log-Pseudolikelihood	-3217.4			-1132.7			-1813.62		
Pseudo R2	0.334			0.491			0.265		
# of observations	7261			3505			3643		
Predicted probability	80.93			85.85			76.45		

Note: *< 10%, ** < 5% and *** < 1%. *The values in parenthesis are the robust standard errors.*

In advanced economies, expansion probability increases with limited flexibility ERR (ERR2) as compared to pegged ERR. Corresponding marginal effect shows that the probability of expansion is higher by 8.3 percentage points in limited flexibility ERR than pegged ERR. There is no significant association between the managed floating ERR episodes and the probability of expansions. This indicates that the performance of managed floating ERR is not significantly different from that of the pegged ERR prevailing episodes. However, the probability of expansions is much higher in freely floating ERR (ERR4) than pegged ERR. The associated marginal effect shows that the probability of expansions is higher by 23.4 percentage points in economies with freely floating ERR. There is no significant relationship between GFC and business cycles. The predicted probability indicates that almost 86 percent of observations in the sample of AE appears to have expansionary period. In comparison to pegged ERR, limited flexibility ERR tends to increase the probability of expansions in the sample of emerging market and developing economies. The associated marginal effect indicates that the probability of expansions is higher by 9.6 percentage points in limited flexibility ERR episodes. However, the probability of business cycle expansions decreases with ERR flexibility in EMDE. Accordingly, managed and freely floating ERR episodes tend to lower the probability of expansions. The corresponding marginal effects indicate that the probability of expansions is lower by 5.5 percentage points in managed floating ERR and 9.7 percentage points in freely floating ERR observations. As compared to managed floating ERR, the probability of expansions is much lower in freely floating episodes. GFC appears to be positively associated with business cycles. In this vein, favorable (worsening) GFC tends to increase (decrease) the probability of expansions. The predicted probability shows that almost 76 percent of the observations in EMDE tend to experience expansion.

We also estimate Eq. (1) by employing probit estimation procedure. Table 3 presents the estimation results. The probit estimation procedure provides essentially the same results with those reported by Table 2.

Table 3: Probit Estimation Results for Eq. (1)

	Whole Sample		Advanced Economies		Emerging Market and Developing Economies	
	Coefficient Estimates	Marginal Effects	Coefficient Estimates	Marginal Effects	Coefficient Estimates	Marginal Effects
$ERR2_{it}$	0.424***	0.106***	0.473***	0.084***	0.273***	0.077***
	(0.076)	(0.019)	(0.130)	(0.023)	(0.103)	(0.029)
$ERR3_{it}$	0.083	0.021	0.065	0.012	-0.239**	-0.067**
	(0.081)	(0.020)	(0.205)	(0.036)	(0.105)	(0.030)
$ERR4_{it}$	0.624***	0.156***	1.268***	0.225***	-0.404**	-0.114**
	(0.121)	(0.030)	(0.195)	(0.033)	(0.200)	(0.056)
D_GFC_t	0.704**	0.176**	0.640	0.114	0.605*	0.170*
	(0.358)	(0.089)	(0.698)	(0.124)	(0.309)	(0.104)
Constant	-1.716***		-5.509***		-1.104***	
	(0.326)		(0.681)		(0.347)	
Log-Likelihood	-3227.80		-1128.53		-1815.69	
Pseudo R^2	0.331		0.492		0.265	
# of observations	7261		3505		3643	
Predicted probability	80.04		84.96		75.68	
Note: * < 10%, ** < 5% and *** < 1%. The values in parenthesis are the robust standard errors.						

The relatively long-time span of our data allows us to examine the changes in business cycles-ERR relationship during the recent globalization episode in comparison to the earlier periods. Most of the studies maintain that globalization has increased substantially during the 1990s. In this vein, we disaggregate our sample into pre- and post-globalization periods.

Table 4 presents the probit[3] estimation results of eq. (1) during the pre- and post-globalization episodes. As compared to ERR1, the recession probability tends to diminish with ERR flexibility during the pre-globalization period for the whole sample. This is almost the case for the post-globalization period. Favorable GFC appears to increase expansion probability in the post-globalization period. The results for the whole sample are almost the same for advanced economies. In a similar vein to our earlier findings, compared to ERR1, the

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3   We also employ logit estimation procedure. Our empirical findings, not reported to save space but available upon request, are essentially the same with those presented by Table 4.

Table 4: Probit Estimation Results for Eq. (1)

| | Whole Sample | | | | Advanced Economies | | | | Emerging Market and Developing Economies | | | |
	Pre-Globalization Period (1979Q2-1989Q4)		Post-Globalization Period (1990Q1-2019Q4)		Pre-Globalization Period (1979Q2-1989Q4)		Post-Globalization Period (1990Q1-2019Q4)		Pre-Globalization Period (1979Q2-1989Q4)		Post-Globalization Period (1990Q1-2019Q4)	
	Estimated parameters	Marginal Effects	Estimated parameters	Marginal Effects	Estimated parameters	Marginal Effects	Estimated parameters	Marginal Effects	Estimated parameters	Marginal Effects	Estimated parameters	Marginal Effects
$ERR2_{it}$	0.841** (0.333)	0.109** (0.042)	0.409*** (0.077)	0.133*** (0.025)	2.634*** (0.601)	0.342*** (0.091)	1.007*** (0.135)	0.310*** (0.040)	2.664*** (0.696)	0.669*** (0.151)	0.070* (0.039)	0.023* (0.012)
$ERR3_{it}$	1.324*** (0.354)	0.172*** (0.045)	0.028 (0.087)	0.009 (0.028)	-1.927 (1.706)	-0.250 (1.100)	0.103 (0.199)	0.032 (0.061)	1.409 (1.435)	0.354 (0.399)	-0.185* (0.104)	-0.062* (0.063)
$ERR4_{it}$	5.675*** (0.584)	0.739*** (0.089)	0.574*** (0.131)	0.224*** (0.043)	2.846*** (0.711)	0.370*** (0.088)	1.630*** (0.174)	0.494*** (0.053)			-0.503** (0.191)	-0.167** (0.063)
D_GFC_t	-0.762 (1.045)	-0.099 (0.135)	0.518*** (0.037)	0.168*** (0.011)	-0.498 (1.173)	-0.065 (0.152)	0.724*** (0.056)	0.223*** (0.016)	-0.240 (0.162)	-0.060 (0.041)	0.370*** (0.049)	0.123*** (0.016)
Constant	1.424 (0.944)		0.099 (0.139)		3.165** (1.124)		-3.101*** (0.359)		-2.110** (1.035)		0.321** (0.145)	
Log-Pseudolikelihood	-182.53		-3412.61		-139.68		-1483.82		-154.07		-1894.38	
Pseudo R^2	0.61		0.146		0.577		0.184		0.366		0.130	
# of observations	799		5970		608		2738		363		3232	
Predicted probability	92.37		69.11		92.76		71.55		79,60		66.52	

Note: *** < 10%, ** < 5% and *** < 1%. The values in parenthesis are the robust standard errors.*

probability of expansions increases with ERR2 during both periods[4]. The recession (expansion) probability tends to increase (decrease) with ERR flexibility during the post-globalization period for the sample of emerging market and developing economies. In the post-globalization period, worsening (favorable) GFC appears to increase the recession (expansion) probability in emerging market and developing economies.

5. Concluding Remarks

Does the prevailing exchange rate regime (ERR) matter for the business cycles? The literature provides puzzling evidence on this important issue. This paper investigates the relationship between ERR and classical business cycles in advanced (AE) and emerging market and developing economies (EMDE) after considering the effect of global financial cycle (GFC).

The main properties of classical business cycles suggest that the average duration of contractions and expansions are almost similar both in AE and EMDE, albeit the average duration of contractions are much lower than that of expansions. Also, the average amplitude, slope and cumulative effect of contractions and expansions are much higher in EMDE than AE. These facts state that EMDE, as compared to AE, tends to have deeper recessions and steeper expansions. The business cycle properties of favorable and worsening global financial cycle (GFC) are almost the same. The empirical findings suggest that prevailing ERR tends to matter for the evolution of classical business cycles both in AE and EMDE. This appears to be the case during both pre- and post-globalization periods.

Our logit and probit regression results suggest that, relative to pegged ERR, expansion probability increases with ERR flexibility in the whole sample and AE, except managed floating ERR episodes. We find that expansion probability increases with limited flexibility ERR in EMDE. However, managed and freely floating ERRs tend to diminish the probability of business cycle expansions. This is consistent with the "fear of floating" argument suggested by Calvo and Reinhart (2002). Our findings suggest that intermediate ERRs like limited flexibility is a better choice for EMDE. As compared to AE, EMDE are financially less open and less developed. In this context, limited flexibility ERR provides relative exchange rate stability that encourages investment and growth. Consistent with the recent literature, our empirical findings suggest that favorable (worsening) GFC tends to increase (mitigate) the expansion probability in both samples during the post-globalization period.

The empirical results in this paper suggest that the prevailing ERR matters for the business cycles in AE and EMDE. Considering the levels of income, financial development and openness affect the choice of ERR, freely floating and limited flexibility perform better, respectively, in AE and EMDE.

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4   Figure 1 suggests that ERR1, ERR2 and ERR3 are prevailing regimes during the pre-globalization period in EMDE. Therefore, we exclude ERR4 in our estimates for the pre-globalization period.

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Appendix

Table A1: Country Classification and Time Period

	Country Classification	Time Period		Country Classification	Time Period
Argentina	EMDE	1979Q2-2019Q4	Korea R.	EMDE	1979Q2-2019Q4
Australia	AE	1979Q2-2019Q4	Latvia	EMDE	1995Q1-2019Q4
Austria	AE	1979Q2-2019Q4	Lithuania	EMDE	1995Q1-2019Q4
Belgium	AE	1979Q2-2019Q4	Luxem-bourg	AE	1979Q2-2019Q4
Brazil	EMDE	1979Q2-2019Q4	Malaysia	EMDE	1979Q2-2019Q4
Bulgaria	EMDE	1995Q1-2019Q4	Mexico	EMDE	1979Q2-2019Q4
Canada	AE	1979Q2-2019Q4	Netherlands	AE	1979Q2-2019Q4
Chile	EMDE	1979Q2-2019Q4	New Zea-land	AE	1979Q2-2019Q4
Croatia	EMDE	1995Q1-2019Q4	Norway	AE	1979Q2-2019Q4
Cyprus	AE	1995Q1-2019Q4	Peru	EMDE	1979Q2-2019Q4
Czech R.	EMDE	1996Q1-2019Q4	Philippines	EMDE	1979Q2-2019Q4
Denmark	AE	1979Q2-2019Q4	Poland	EMDE	1995Q1-2019Q4
Ecuador	EMDE	2000Q1-2019Q4	Portugal	AE	1979Q2-2019Q4
Estonia	EMDE	1995Q1-2019Q4	Romania	EMDE	1995Q1-2019Q4
Finland	AE	1979Q2-2019Q4	Russia	EMDE	1995Q1-2019Q4
France	AE	1979Q2-2019Q4	Saudi Ara-bia	EMDE	1979Q2-2019Q4

Germany	AE	1979Q2-2019Q4	Serbia	EMDE	1995Q1-2019Q4
Greece	AE	1979Q2-2019Q4	Singapore	EMDE	1979Q2-2019Q4
Honduras	EMDE	2000Q1-2019Q4	Slovenia	EMDE	1995Q1-2019Q4
Hungary	EMDE	1995Q1-2019Q4	South Africa	EMDE	1979Q2-2019Q4
India	EMDE	1979Q2-2019Q4	Spain	AE	1979Q2-2019Q4
Indonesia	EMDE	1979Q2-2019Q4	Sweden	AE	1979Q2-2019Q4
Ireland	AE	1979Q2-2019Q4	Switzerland	AE	1979Q2-2019Q4
Israel	EMDE	1995Q1-2019Q4	Thailand	EMDE	1979Q2-2019Q4
Italy	AE	1979Q2-2019Q4	Türkiye	EMDE	1979Q2-2019Q4
Japan	AE	1979Q2-2019Q4	UK	AE	1979Q2-2019Q4
Jordan	EMDE	1992Q1-2019Q4	US	AE	1979Q2-2019Q4
Kazakh-stan	EMDE	1994Q1-2019Q4			