THE PERFORMANCE OF U.S. ECONOMIC FUNDAMENTALS IN THE U.S. DOLLAR'S LONG-TERM CYCLES

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ABSTRACT

This study addresses the relationship between the long-term patterns of strong and weak U. S. dollar and U.S. economic fundamentals over a 45-year period from 1974 to 2019. The real trade weighted U.S. dollar index and 72 macroeconomic variables are used in this study. We apply the Hodrick-Prescott filter to derive the cycles of U.S. dollar over long-term trends and identify dollar appreciation and depreciation periods. Furthermore, we divide each appreciation and depreciation period into subperiods for associated strong and weak dollar regimes. The growth of or the change in each economic variable is examined over different stages of these cycles. We found that several economic series show significantly positive or negative growth or changes during strong or weak dollar periods.

INTRODUCTION

The value of a currency in the international financial markets is defined as the price of one currency with respect to another or a basket of currencies. Under the floating exchange rate regime, exchange rates are considered as commodity prices. The fluctuation of exchange rates reflects the changes in the supply of and the demand for the currency. The terms “strong dollar” and “weak dollar” may be confusing, misleading, or carrying no meaningful implications. However, the terms are commonly used in news medias, business, governments, and academics. The terms “strong and weak” and “strengthening and weakening” are relative terms used to describe appreciating and depreciating currencies, respectively, of a given currency from a previous and or historical level/s (Schilling, 1998). Strong or weak dollars may have economic consequences. A strong dollar (when dollar buys more units of a given foreign currency) is generally expected to lower exports and higher imports, where lower exports lead to lower production and employment, and higher imports lead to higher domestic price competition and lower prices and inflation. A lower inflation in turn could further strengthen the currency. A weak dollar (when dollar buys fewer units of a given foreign currency) on the other hand, is expected to lead to higher exports, lower imports, higher production and employment, lower domestic price competition, higher prices and therefore higher inflation. This high inflation in turn could lead to further weakening of the dollar, and feed on itself. Furthermore, a macroeconomic variable may induce the appreciation or depreciation of the currency due to its effects on the supply of and the demand for the currency.

The purpose of this study is to examine the responses and interactions of macroeconomic fundamentals to strong dollar and weak dollar. We define strong/weak dollar regimes in terms of long-term exchange rate trends. A regime with consistent dollar appreciation/depreciation relative to a previous or historical level is considered strong/weak dollar regime. We apply the Hodrick-Prescott filter (HP filter) to identify these regimes over a period of 45 years between 1974 and 2019. Based on the HP filter, we found that the US dollar exhibits long-terms cycles with two peaks and three troughs. A dollar appreciation period is the period from the trough to the peak and a dollar depreciation period is the period from the peak to trough. We divide each appreciation and depreciation period into three or five phases. A strong/weak dollar regime is defined as the appreciation/depreciation phases close to peaks/troughs. The performance of 72 macroeconomic variables in these strong/weak dollar regimes are studied. There has been no empirical study on the behavior of key macroeconomic fundamentals over the strong and weak U.S. dollar regimes. This study provides some empirical support and addresses this gap in the literature. The results of this study also provide support for pursuing appropriate U. S. dollar policy and any needed government intervention to do so for maintaining sound economic fundamentals.

Section 2 reviews the studies on the relationship between exchange rates and macroeconomic fundamentals. Section 3 describes the methodology and the data. Section 4 presents the results and last section provides conclusions.

LITERATURE REVIEWS

The determination of exchange rates mainly resides on three theories: the purchasing power parity (PPP), the uncovered interest rate parity (UIP), and the monetary models. The purchasing power parity links exchange rates with the relative price levels in domestic and foreign countries; the uncovered interest rate parity links exchange rates with interest rate differentials between two countries. The price-flexible monetary model argues that the exchange rate is mainly determined in assets markets (Frenkel, 1976, Mussa, 1976, Bilson, 1978). The extension of the price-flexible monetary model includes the sticky-price monetary model (Dornbush, 1976 and Frankel, 1979 & 1985), the sticky-price asset model (Hooper and Morton, 1982), and Taylor rule model (Engel and West, 2005). The sticky-price type models allow short-term price rigidities along with the long-run purchasing power parity. Taylor rule model adds potential GDP and inflation rate to the exchange rate determinants.

In analyzing an exchange rate determination model, the first empirical issue is the data collection. For a bilateral exchange rate such as U.S. dollar vs. Japanese yen, it involves only two countries and only one cross-sectional data point. A meaningful statistical analysis on the properties of a bilateral exchange rate for the two countries naturally leads to time series analysis. A common theme of the time series analysis is out-of-sample forecasts. Hence, the predictability of macroeconomic variables on exchange rates became the main topic in the empirical analysis of exchange rates. Comparing with the three types of monetary models, Meese and Rogoff (1983) find that random walk models provide better forecast to explain exchange rates than any models including the macroeconomic fundamentals such as money supply, real income, interest rate differential, and expected long-run inflation differentials. Meese and Rogoff (1988) and Engel (2016) focus on the issues on UIP. The puzzle of the unpredictable exchange rates by macroeconomic fundamentals have been challenged by many researches. Mark (1995) shows that the predictability may exist in long horizon forecasts; Engel and West (2005) explain the puzzle and conclude that the macroeconomic fundamentals can predict very little of exchange rates, instead, exchange rate helps predicting macroeconomic fundamentals. Cheung et al. (2005) reexamine and expand these models with additional variables such as net foreign asset positions and productivities differences.

In additional to the expansion of economic variables and theories, different econometric techniques have been added to the predictability analyses. For example, Engel and Hamilton (1990) use regime switching models to derive the predictability of exchange rates; Ricci et al. (2013) examine exchange rates for 48 countries using panel cointegration method; using common factor models, Filippou and Taylor (2017) include 127 domestic variables and 97 global variables while Greenaway-McGrevy et al. (2018) include 27 variables. There are vast amounts of the researches on the predictability of exchange rates. A survey of these literatures can be found in Rossi (2013) and Kavtaradze and Mokhtari (2018).

The empirical studies on exchange rates with time series use either levels of or the differences in the logarithm of exchange rates. Meese and Singleton (1982) point out that the conclusions of an economic analysis of exchange rates depend on whether levels or differences of exchange rates are used in the study. Meese and Singleton (1982), Meese and Rogoff (1983, 1988), and many other authors found that exchange rates follow integrated process of order one. Most studies also found that macroeconomic fundamentals are integrated processes of order one (Nelson and Plosser (1982), Murray and Nelson, 2000) while some studies conclude otherwise (DeJong and Whiteman, 1991, Perron and Wada, 2009). With both exchange rates and macroeconomic fundamentals being integrated processes, the cointegration analysis is used to examine the long-run relationship between exchange rates and macroeconomic fundamentals. Meese (1986) concludes the lack of cointegration between exchange rates and market fundamentals provides an evidence of the possible existence of bubbles in exchange rate market; Meese and Rogoff (1988) do not find cointegration between real exchange rates and real interest rates; Ricci et al. (2013) considers a panel cointegration between real exchange rates and a set of fundamentals; Engel and West (2005) apply cointegration, error correction models, and the Granger-casualty test to derive alternative conclusions on exchange predictability.

Compared to predictability and long-run relationship, relatively few researches devote to cyclical relationship between exchange rates and macroeconomic fundamentals. Meese (1986) claims that a dramatic dollar appreciation relatively to market fundamentals in 1980s is an indication of market failure or bubbles. Engel and Hamilton (1990) use a Markov switching model to demonstrate the value of the dollar appears to move in one direction for long periods of time. Most studies conclude that the time series properties for exchanges rates are different from the properties for macroeconomic fundamentals. This paper focuses on their differences in terms of long-term trends and adopts a new approach to examine their relationship over long-term cycles.

METHODOLOGY AND DATA

To determine strong/weak dollar regimes, we begin with the identification of long-term cycles of the U.S. dollar. If long-term cycles exist, we can determine the turning points of the cycles, appreciation and depreciation periods, and strong/weak dollar regimes. The turning points of the business cycles identified by the *National Bureau of Economic Research* (NBER) are commonly used to classify the recessions and expansions in the U.S. economy. The alternative methods to date the turning points of business cycles include: The Beveridge-Nelson (BN) decomposition (Beveridge and Nelson, 1981), the unobserved components (UC) (Harvey and Todd, (1983), Watson (1986), and Clark (1987)), the Hodrick and Prescott (HP) filter (Hodrick and Prescott, 1997), and the Markov switching model (Hamilton, 1989). The BN and UC decompositions, and the Markov switching methods are all based on the assumption that the series is an integrated process. The BN and UC decompositions identify two components: 1) the stochastic trend component, which is characterized by a random walk with drift process, and 2) the cyclical component, which is the residuals of the original series after the stochastic trend component is removed. Oh et al. (2008) explain the relationship between the BN and the UC decompositions. The HP filter is a numerical method to smooth a trend stationary or nonstationary series. The smoothed series derived by the HP filter has a deterministic nonlinear trend. The difference between the original series and the smoothed trend series from the HP filter is also called the cyclical component. Both the stochastic trends from the BN and UC decompositions and the deterministic trends from the HP filter are identified as long-term trends. A main application of these decompositions is to use the cyclical component to analyze the patterns of cycles and date the turning points of the cycles. Another application of the decompositions is to analyze the permanent and transitory effects of an economic shock; based on the decomposition of a series, the long-term trend component is related to permanent effects and the cyclical component is related to transitory effects (Beveridge and Nelson, 1981, Oh et al., 2008).

We apply the BN decomposition and the HP filter to examine the properties of the long-term trend and the cyclical component for exchange rates. Since real GDP is commonly used for testing long-term trend and constructing business cycles (Hamilton, 1989, Morley et al., 2003, Perron and Wada, 2009), we compare exchange rates with real GDP based on these two decomposition methods. The comparison provides us some insights on the distinct features in exchange rates. Figure 1 shows the graph of the logarithm of real GDP with quarterly frequency from the first quarter of 1947 to the second quarter of 2019. The two series in the upper portion of the figure are the original series and the long-term trend series derived from the HP filter. The line graphs for these two series are very close; the original series moves around the smooth trend series. The series in the lower portion of the figure is the HP cyclical component, which is more volatile and does not have a long-term trend. The shade areas are the recession periods identified by the NBER. Most downturns of the cyclical component are consistent with the recessions. To compare real GDP with exchange rates, the data of the logarithm of real GDP starting from 1974 are shown in Figures 2 and 3. Figure 2 is the same as Figure 1, except with a shorter sample period. Figure 3 shows the series from the BN decomposition assuming the differences of the logarithm of real GDP is an autoregressive process of order 2. The line graphs for the original series and the long-term stochastic trend are very close and they are indistinguishable in the upper portion of the figure. Visually, the BN long-term trend is not as smooth as the HP long-term trend in Figure 2. Also, the BN cyclical component has a smaller amplitude and more frequent ups and downs than the HP cyclical component (Morley et al., 2003, Perron and Wada, 2009).

Figure 1

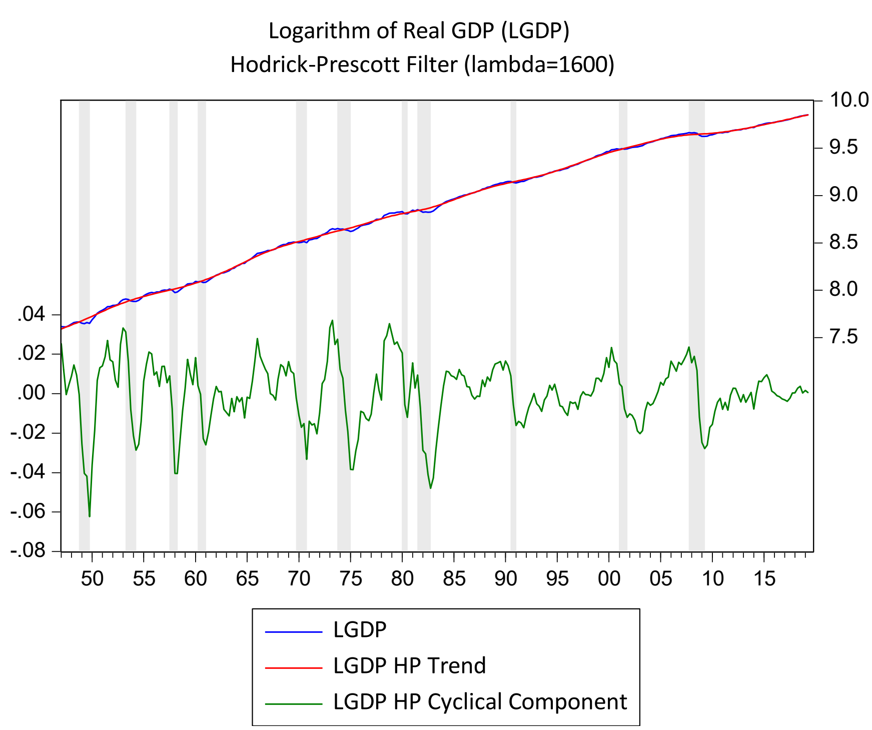


Figure 2

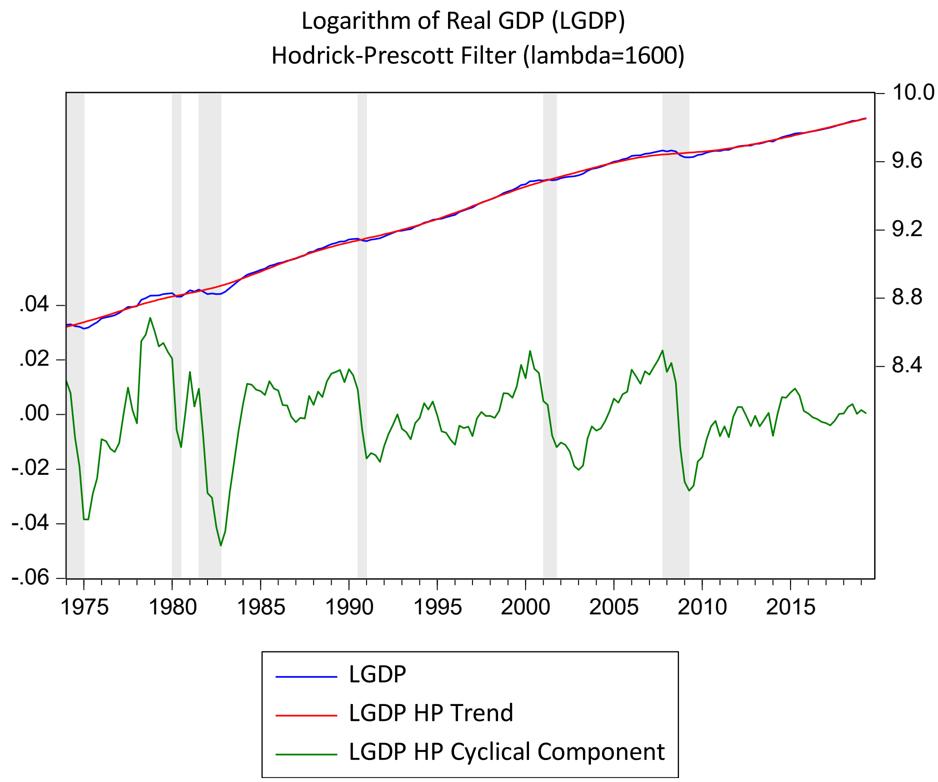
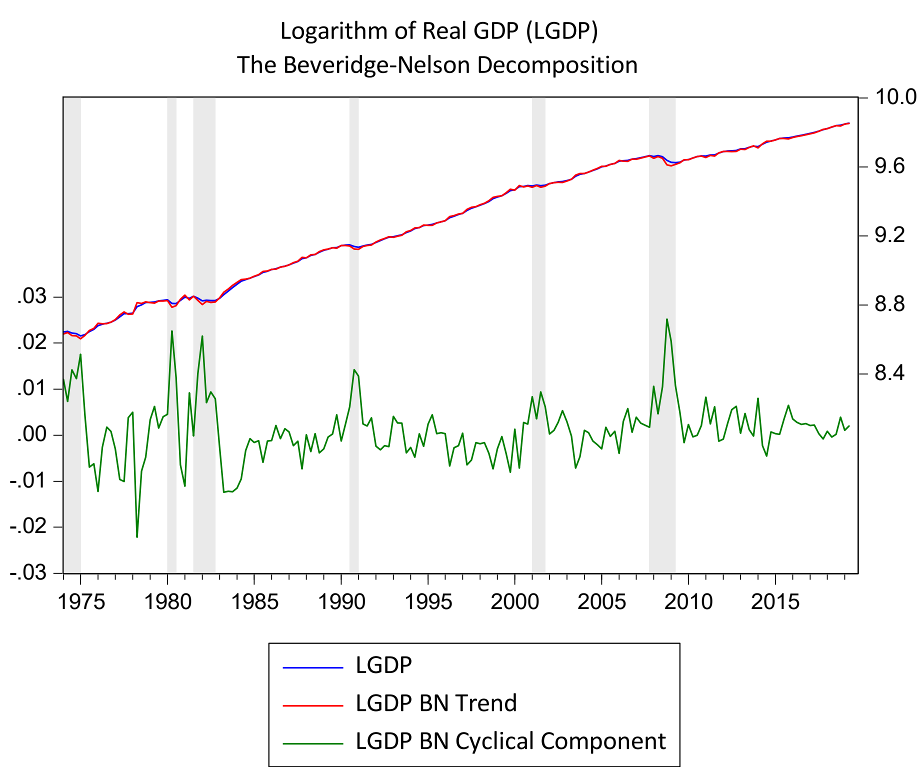


Figure 3



Figures 4 and 5 show the HP and BN decompositions, respectively, for the logarithm of real trade weighted U.S. dollar index from January 1974 to July 2019, where the data are in monthly frequency and are not seasonally adjusted. In Figure 4, the upper portion shows the original series and the HP long-term trend with cycles, and lower portion shows the HP cyclical component. The cyclical component does not have any obvious trends or cycles; it has more frequent ups and downs than the long-term trend series, and the downturns are not consistent with the recessions identified by the NBER. Figure 5 shows the series from the BN decomposition, with the original series and the long-term trend in the upper portion of the figure and with the cyclical component in the lower portion of the figure. Comparing the HP filter in Figures 4 with the BN decomposition in Figure 5, the original series and the HP long-term trend are significantly distinct, whereas the original series and the BN long-term trend are very close to each other and they are visually indistinguishable. Comparing with the HP cyclical component, the BN cyclical component has a smaller amplitude and more frequent ups and downs. These differences between the HP and BN decompositions for the dollar index in Figures 4 and 5 are similar to the differences for real GDP in Figures 2 and 3. The results are consistent with the observation by Hamilton (2018) who indicates that the HP cyclical component is more persistent with less frequent ups and downs than the cyclical component from the BN or UC decomposition.

Figure 4

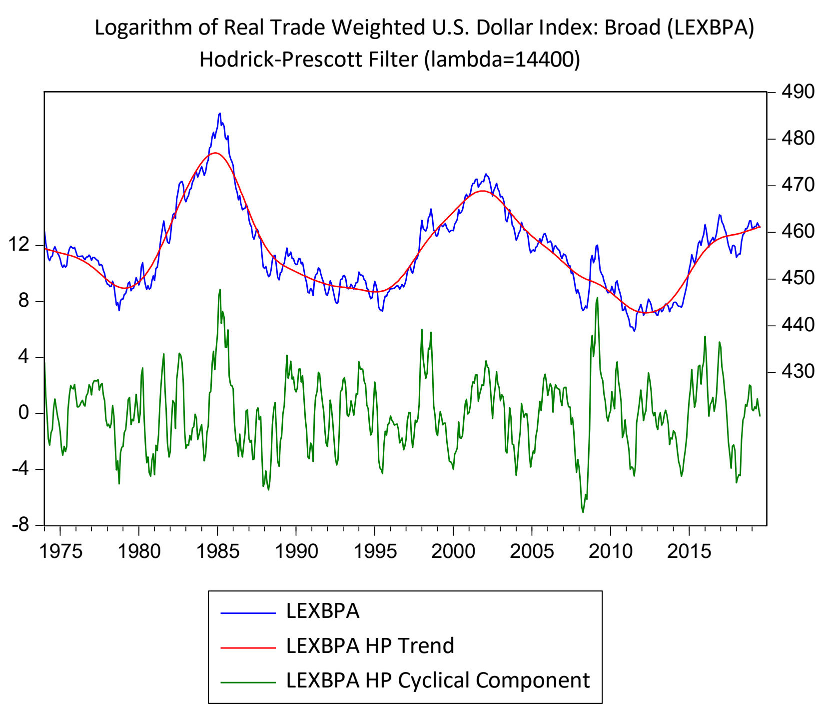
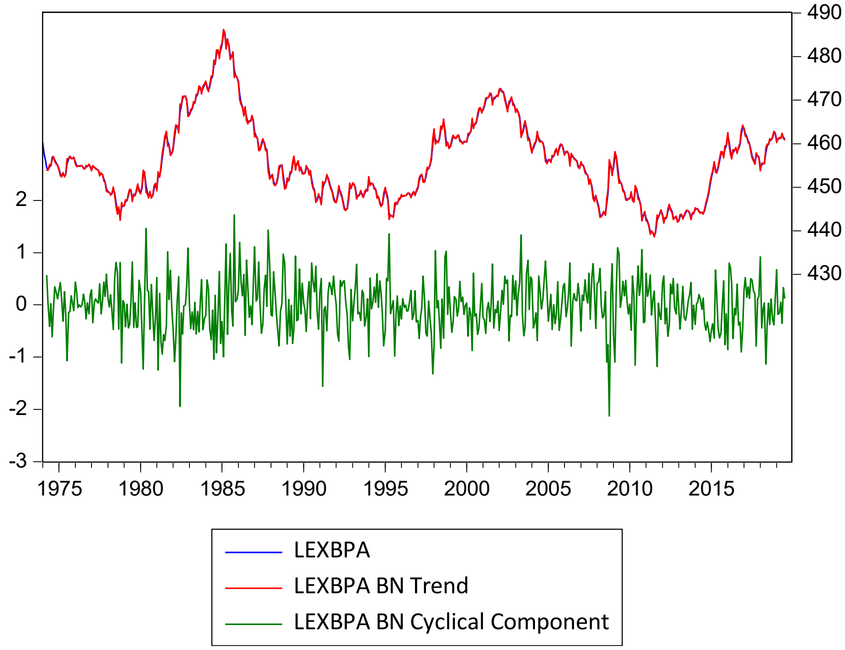


Figure 5

Logarithm of Real Trade Weighted U.S. Dollar Index: Broad (LEXBPA)
The Beveridge-Nelson Decomposition



A major difference between the dollar index and real GDP is in their long-term trend patterns. Comparing the HP trend components for real GDP in Figures 2 with the dollar index in Figure 4, the distinction between the original series and its HP long-term trend is more obvious than the distinction between the original series of real GDP and its HP long-term trend. Most importantly, the HP long-term trend for the dollar index is a smooth curve with distinct cycles while real GDP does not have any sign of long-term cycles. Although the data of the dollar index is not seasonally adjusted, its long-term trend cycles do not exhibit periodical movements like those seasonal patterns explained by seasonal factors. These cycles are characterized by two peaks and three troughs over 45 years period. Researchers commonly use “cycles” to describe possible patterns of the time series. We need to differentiate the “long-term trend cycles” for the dollar index defined in this paper from the “cycles” implied by the business cycles analysis. The long-term trend cycles for the dollar index are defined and derived from the long-term pattern, whereas the cyclical patterns of business cycles are associated with the short-term cyclical component in the business cycles analysis. This unique nature of long-term trend cycles of the dollar index may contribute to the poor predictability of macroeconomic fundamentals and the lack of long-run relationship between exchange rates and macroeconomic fundamentals if the pattern of such long-term trend cycles is ignored in estimation. In recognizing the long-run trend cycles of exchange rates, we develop a new method to examine the relationship between exchange rates and macroeconomic fundamentals.

Based on the smooth long-term trend for the dollar index derived from the HP filter, we identify the turning points of the long-term cycles and define the dollar appreciation and depreciation periods. Table 1 summaries these periods. The dollar appreciation periods include the periods from the trough to the peak in each cycle, which include March 1979 – November 1984 (69 months), March 1995 – November 2001 (81 months), and May 2012 – July 2019 (87 months); the dollar depreciation periods include the periods from the peak to the trough in each cycle, which include January 1974 – February 1979 (62 months), December 1984 – February 1995 (123 months), and December 2001 – April 2012 (125 months). Based on the derived appreciation/ depreciation periods, an easy solution to identify strong/week dollar regimes is mapping from strong and weak dollar regimes to appreciation and depreciation periods. A simple analysis of the performance of a macroeconomic series in strong and weak dollar regimes is to compare the means of the series in appreciation and depreciation periods. Several issues can arise from this simple comparison. First, most macroeconomic series are either trend-stationary or nonstationary with the integrated order of one. It is important to decide whether the level or the differences of the series should be used in the comparison (Meese and Singleton, 1982). Second, a strong/weak dollar regime may not cover the whole appreciation/depreciation period. The impacts of strong/weak dollar on macroeconomic fundamentals may not be uniformly the same in the whole appreciation or depreciation period. Their impacts can be either short for a few months or long for several years. Hence, besides strong and weak dollar regimes, there may be a “normal” regime, which is between the strong and weak dollar regimes during the long-term cycles. Third, strong/weak dollar regimes may have leading or lagging impacts on macroeconomic fundamentals. The time shift of the impacts is related to the casual relationship. If a macroeconomic fundamental causes dollar appreciations or depreciations, it may lead the changes in exchange rates.

Table 1 The Appreciation and Depreciation Periods of the Broad Real Trade Weighted US. Dollar Index
Monthly Data

Depreciation		N	Appreciation		N
1974:01 – 1979:02		62	1979:03 – 1984:11		69
D_1	1974:01 – 1974:12	12	U_1	1979:03 – 1980:02	12
D_2	1975:01 – 1975:12	12	U_2	1980:03 – 1981:04	14
D_3	1976:01 – 1977:02	14	U_3	1981:05 – 1982:09	17
D_4	1977:03 – 1978:02	12	U_4	1982:10 – 1983:11	14
D_5	1978:03 – 1979:02	12	U_5	1983:12 – 1984:11	12
1984:12 – 1995:02		123	1995:03 – 2001:11		81
D_1	1984:12 – 1986:05	18	U_1	1995:03 – 1996:02	12
D_2	1986:06 – 1988:05	24	U_2	1996:03 – 1997:08	18
D_3	1988:06 – 1991:08	39	U_3	1997:09 – 1999:05	21
D_4	1991:09 – 1993:08	24	U_4	1999:06 – 2000:11	18
D_5	1993:09 – 1995:02	18	U_5	2000:12 – 2001:11	12
2001:12 – 2012:04		125	2012:05 – 2019:07		87
D_1	2001:12 – 2003:05	18	U_1	2012:05 – 2013:04	12
D_2	2003:06 – 2005:05	24	U_2	2013:05 – 2014:10	18
D_3	2005:06 – 2008:10	41	U_3	2014:11 – 2017:01	27
D_4	2008:11 – 2010:10	24	U_4	2017:02 – 2018:07	18
D_5	2010:11 – 2012:04	18	U_5	2018:08 – 2019:07	12

The first issue in comparing the means of the macroeconomic fundamental series in the strong dollar regime verse in the weak dollar regime is related to the stationarity property of the series. If a time series is trend stationary or nonstationary with the integrated order of one, then the mean of the series is not a constant over time. The comparison of the means of the level of the series in different periods is inappropriate in this case. Hence, the growth of or the change in the series is used for the comparison. A simple regression model for the comparison is

$$\Delta y_t = \beta_0 + \beta_1 U_t + \varepsilon_t, \tag{1}$$

where Δy_t is the growth of or the change in a macroeconomic series y_t, U_t represents a dummy variable with $U_t = 1$ for t in appreciation periods and $U_t = 0$ for t in depreciation periods, and ε_t is the random errors term. The estimate of β_0 measures the mean of Δy_t during the weak dollar regime, and the estimate of β_1 measures the difference of the means of Δy_t between the strong dollar regime and the weak dollar regime. This model implies that Δy_t is not a "constant-mean" stationary series; it has two means depending on strong and weak dollar regimes. The coefficients of βs show the impacts of exchange rates on macroeconomic fundamentals over exchange rate's long-term cycles. Since the dependent variable is the growth of or the change in a macroeconomic fundamental, the measure of impacts on the original series should be of short-term nature. But the impacts come from the long-term patterns in exchange rates since U_t is defined by long-term trend. Hence, the coefficient of βs measures the impacts on short-term adjustment of a macroeconomic series induced by the long-term patterns of exchange rates. This is similar to the error-correction model in the cointegration analysis. The error-correction term is derived from the long-term relationship between two series; the inclusion of the error-correction term in the error-correction model is to measure the short-term adjustment of one series to the long-term relationship. With the possible autocorrelation for Δy_t and considering short-term dynamic impacts from exchange rates, an extension of Equation (1) is

$$\begin{aligned}\Delta y_t = \beta_0 + \beta_1 U_t + a_1 \Delta y_{it-1} + a_2 \Delta y_{it-2} + \cdots + a_p \Delta y_{t-p} \\ + b_0 x_{ct} + b_1 x_{ct-1} \cdots + b_q x_{ct-q} + c_1 x_{ct+1} + c_2 x_{ct+2} \cdots + c_r x_{ct+r} + \varepsilon_t, \qquad (2)\end{aligned}$$

where x_{ct} is the HP cyclical component of exchange rates. The coefficients of x_{ct} and its leads and lags measure short-term impacts of exchange rates. Denote y_{ct} as the HP cyclical component for y_{it}. Replacing Δy_t by y_{ct}, substituting exchange rates by real GDP, and assuming $\beta_1 = 0$, $a_j = 0$ for all $j \geq 1$, $q = 2$, and $r = 2$ in Equation (2), it gives the regression equation used by Hodrick and Prescott (1997) and they used the R-squared from the regression as a measure of the strength of association between a macroeconomic series and real GDP. When $\beta_1 = 0$; $b_0 \neq 0$; $a_j \neq 0$, $b_j \neq 0$ for some $j \geq 1$; and $c_j = 0$ for all j, Equation (2) is similar to an autoregressive distributed lags model. Assuming $b_0 = 0$ in the autoregressive distributed lags model, the model becomes a vector autoregressive model for testing the Granger-causality of exchange rates. The inclusion of U_t and leads/lags of x_{ct} implies that the model in Equation (2) considers both long-term and short-term impacts from exchange rates.

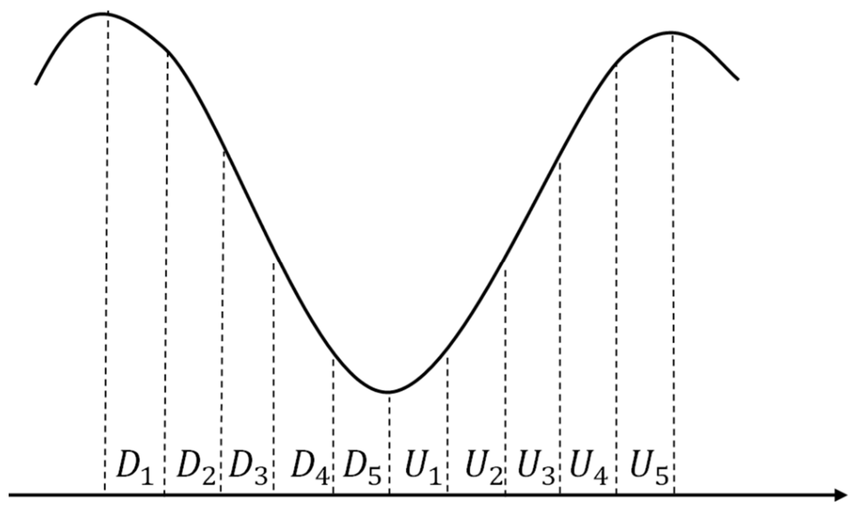
The second issue in the simple regression analysis as in regression (1) is that the mean in the strong/weak dollar regime is a constant for the whole appreciation or depreciation periods. It is possible that a strong/weak dollar regime is shorter than the whole appreciation/depreciation period. In addition to strong and weak dollar regimes, there may be periods with the "normal" regime in each appreciation/depreciation period. The macroeconomic series may react differently in strong/weak dollar regimes than in a normal regime. To consider possible strong, weak, and normal regimes, we divide each appreciation and depreciation period into five subperiods for monthly data (Liu and Spector, 2005). Figure 6 shows an example of a cycle with five subperiods D_1, D_2, D_3, D_4, and D_5 in the downward phase, and five subperiods U_1, U_2, U_3, U_4, and U_5 in the upward phase. Table 1 shows the dates of these subperiods for the appreciation and depreciation periods derived from the HP long-term trend. Based on these subperiods, we expect the strong dollar regime to be the subperiods close to the peaks (U_5 and D_1), the weak dollar regime to be the subperiods close to the troughs (D_5 and U_1), and the normal regime in the other subperiods. With these ten subperiods, Equation (1) is revised as

$$\begin{aligned}\Delta y_t = {} & \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \beta_5 D_{5t} \\ & + \beta_6 U_{1t} + \beta_7 U_{2t} + \beta_8 U_{3t} + \beta_9 U_{4t} + \beta_{10} U_{5t} + \varepsilon_t, \end{aligned} \quad (3)$$

where $D_{it} = 1$ for t in D_i and $D_{it} = 0$ for t not in D_i; $U_{it} = 1$ for t in U_i and $U_{it} = 0$ for t not in U_i. The estimates of βs measure the performance of each macroeconomic series in the ten subperiods. Similar to the extension from Equation (1) to (2), the lagged dependent variables, and x_{ct} and its leading and lagging variables in Equation (2) can be added to Equation (3) to become an extended version of Equation (3).

Equation (3) with ten dummy variables for different subperiods is used for monthly data. For quarterly data, we only consider three subperiods for each appreciation/depreciation period because each quarterly data series contains less data values. The three subperiods in the depreciation period are denoted as D_{q1}, D_{q2}, and D_{q3}; the three subperiods in the appreciation period are denoted as U_{q1}, U_{q2}, and U_{q3}. With these six subperiods, the dummy variables D_{qit}

Figure 6
Ten Subperiods in a Cycle



and U_{qit} are created, where $D_{qit} = 1$ for t in D_{qi} and $D_{qit} = 0$ for t not in D_{qi}; $U_{qit} = 1$ for t in U_{qi} and $U_{qit} = 0$ for t not in U_{qi}. With only three dummy variables in each appreciation and depreciation period, Equation (3) is revised to include these six dummy variables; the strong dollar periods are U_{q3} and D_{q1} and the weak dollar periods are D_{q3} and U_{q1}. The dates of these subperiods for the quarterly data are shown in Table 2.

Table 2 The Appreciation and Depreciation Periods of the Broad Real Trade Weighted US. Dollar Index
Quarterly Data

Depreciation		N	Appreciation		N
1974:Q1 – 1979:Q1		21	1979:Q2 – 1984:Q4		23
D_{q1}	1974:Q1 – 1975:Q2	6	U_{q1}	1979:Q2 – 1980:Q3	6
D_{q2}	1975:Q3 – 1977:Q3	9	U_{q2}	1980:Q4 – 1983:Q2	11
D_{q3}	1977:Q4 – 1979:Q1	6	U_{q3}	1983:Q3 – 1984:Q4	6
1985:Q1 – 1995:Q1		41	1995:Q2 – 2001:Q4		27
D_{q1}	1985:Q1 – 1986:Q4	8	U_{q1}	1995:Q2 – 1996:Q3	6
D_{q2}	1987:Q1 – 1993:Q1	25	U_{q2}	1996:Q4 – 2000:Q2	15
D_{q3}	1993:Q2 – 1995:Q1	8	U_{q3}	2000:Q3 – 2001:Q4	6
2001:Q – 2012:Q2		42	2012:Q3 – 2019:Q4		29
D_{q1}	2002:Q1 – 2003:Q4	8	U_{q1}	2012:Q3 – 2013:Q4	6
D_{q2}	2004:Q1 – 2010:Q2	26	U_{q2}	2014:Q1 – 2018:Q1	17
D_{q3}	2010:Q3 – 2012:Q2	8	U_{q3}	2018:Q2 – 2019:Q4	6

The inclusion of the ten subperiods for appreciation and depreciation periods in Equation (3) can help to solve the third issue for monthly series; it allows us to examine the leading or lagging impacts of strong and weak dollar on macroeconomic fundamentals. When the macroeconomic fundamental series leads (lags) the movement of the strong/weak dollar, the impacts appear in D_2, D_4, U_2, and U_4 of the normal regime.

The data used in this study includes 34 monthly series and 38 quarterly series, starting from January 1974 to July 2019. The descriptions of these series are in Table A1 in the appendix. Each macroeconomic series is transformed into either the growth of or the change in the series (Stock and Watson, 2002). The transformed series is denoted as the dependent variable Δy_t in regressions.

RESULTS AND DISCUSSION

Our regression models are based on Equation (2) and the extended version of Equation (3). Table 3 shows a summary of eight models derived from Equation (2). The first model is the main model, which is Equation (2) with six leads and lags for monthly series and four leads and lags for quarterly series. The rest models are derived from this main model with different combinations of lag variables of Δy_t and lead and lag variables of x_{ct}, where x_{ct} is the HP cyclical component for the dollar index. The two variations of these eight models are: 1) replace x_{ct} by the growth of the dollar index Δx_t, and 2) replace the constant term and U_t by ten dummy variables, which are five dummy variables U_{1t}, U_{2t}, U_{3t}, U_{4t}, U_{5t} for each appreciation period and five dummy variables D_{1t}, D_{2t}, D_{3t}, D_{4t}, D_{5t} for each depreciation period for monthly series as in Equation (3). For quarterly data, the constant term and U_t are replaced by six dummy variables U_{q1t}, U_{q2t}, U_{q3t}, D_{q1t}, D_{q2t}, and D_{q3t}. Instead of using x_{ct}, the first variation provides an alternative measure of the short-term impacts of the dollar index. The second variation addresses the key issue of the effects of strong and weak dollars on macroeconomic fundamentals by considering different phases of appreciation and depreciation periods.

Table 3
Eight Regression Models

(1)	ADLF	Autoregressive distributed lag and lead model: $\Delta y_t = \beta_0 + \beta_1 U_t + \beta_2 \Delta y_{t-1} + \cdots + \beta_7 \Delta y_{t-6}$ $+\beta_8 x_{ct} + \beta_9 x_{ct-1} + \cdots + \beta_{14} x_{ct-6}$ $+\beta_{15} x_{ct+1} + \cdots + \beta_{20} x_{ct+6} + \varepsilon_t$
(2)	Means	Constant and a dummy variable $\Delta y_t = \beta_0 + \beta_1 U_t + \varepsilon_t$
(3)	AR	Autoregressive model $\Delta y_t = \beta_0 + \beta_1 U_t + \beta_2 \Delta y_{t-1} + \cdots + \beta_7 \Delta y_{t-6} + \varepsilon_t$
(4)	VAR	Vector autoregressive model $\Delta y_t = \beta_0 + \beta_1 U_t + \beta_2 \Delta y_{t-1} + \cdots + \beta_7 \Delta y_{t-6}$ $+\beta_8 x_{ct-1} + \cdots + \beta_{13} x_{ct-6} + \varepsilon_t$
(5)	DL	Distributed lag model $\Delta y_t = \beta_0 + \beta_1 U_t + \beta_2 x_{ct} + \beta_3 x_{ct-1} + \cdots + \beta_8 x_{ct-6} + \varepsilon_t$
(6)	ADL	Autoregressive distributed lag model $\Delta y_t = \beta_0 + \beta_1 U_t + \beta_2 \Delta y_{t-1} + \cdots + \beta_7 \Delta y_{t-6}$ $+\beta_8 x_{ct} + \beta_9 x_{ct-1} + \cdots + \beta_{14} x_{ct-6} + \varepsilon_t$
(7)	VARF	Vector autoregressive and lead model: $\Delta y_t = \beta_0 + \beta_1 U_t + \beta_2 \Delta y_{t-1} + \cdots + \beta_7 \Delta y_{t-6}$ $+\beta_8 x_{ct-1} + \cdots + \beta_{13} x_{ct-6}$ $+\beta_{14} x_{ct+1} + \cdots + \beta_{19} x_{ct+6} + \varepsilon_t$
(8)	DLF	Distributed lag and lead model: $\Delta y_t = \beta_0 + \beta_1 U_t + \beta_2 x_{ct} + \beta_3 x_{ct-1} + \cdots + \beta_8 x_{ct-6}$ $+\beta_9 x_{ct+1} + \cdots + \beta_{14} x_{ct+6} + \varepsilon_t$

Table 4 summarizes the results for 34 monthly series with the appreciation and depreciation periods (U_t and D_t) included in each of the eight models in Table 3. The dependent variable for each regression is either the growth of or the change in monthly data series listed in Appendix A.

In addition to U_t and D_t, the main explanatory variable for these lag and lead models is either the growth of the dollar index Δx_t or the HP cyclical component of dollar index x_{ct}. When the growth of the dollar index Δx_t is used, dollar appreciation has significant impacts on only three series: Dow Jones Industrial Average (DJIA), S&P 500 index, and five-year treasury bill rates. The upper panel in Table 4 shows the estimated coefficients of U_t and the robust t statistics based on Newey-West standard errors for these three series, where the estimated coefficient for U_t estimates the appreciation impact. Both the growth rates of DJIA and S&P 500 are between 10.06% and 13.94% higher during the appreciation period in four different lead/lag models. The changes in five-year treasury bill rates (GS5) is 0.0564% higher during the appreciation period for the VAR model.

When the HP cyclical component x_{ct} is used as the main explanatory variable, none of the estimated coefficient of U_t is significant for all 34 series and eight models in Table 3. This implies that the differentiation of appreciation and depreciation periods has no impact on any macroeconomic fundamentals. To compare the results using Δx_t with the results using x_{ct} for DJIA and S&P 500, some related estimated coefficients using x_{ct} are shown in the second panel of the table. It shows a large negative and significant coefficient for x_{ct} and a large positive and significant coefficient for x_{ct-1}. This implies the HP cyclical component of exchange rates captures unusual movements of these two series during the appreciation periods. Hence, the use of the HP cyclical component is a better modeling approach to filter the short-run impacts of the dollar index.

To show the impacts of strong/weak dollar in different phases, we use the autoregressive distributed lag and lead model with x_{ct} and ten dummy variables, five for each appreciation period and five for depreciation period (the extended version of Equation (3)), for all monthly data series. In each estimation, we apply LSE's general-to-specific approach (Hoover and Perez, 1999) to select significant coefficients for the dummy variables while keep all lead and lagged variables in the estimation iterations. Table 5 summarizes the results for those series with significant coefficients in the subperiods of appreciations and depreciations. The results show

Table 4 Regressions with the Appreciation and Depreciation Periods for Monthly Series

With the Growth of the Dollar Index Δx_t					
Series	Dow Jones Industrial Average				GS5
Model	(1) ADLF	(5) DL	(6) ADL	(8) DLF	(4) VAR
U_t	10.32* (2.32)	12.31** (2.59)	10.71** (2.85)	12.08* (2.11)	0.0564* (2.04)
Series	S&P 500				
Model	(1) ADLF	(5) DL	(6) ADL	(8) DLF	
U_t	10.06* (2.14)	13.94** (2.72)	11.32** (2.83)	12.61* (2.06)	
With the HP Cyclical Component x_{ct}					
Series	Dow Jones Industrial Average			S&P 500	
Model	(1) ADLF	(6) ADL	(8) DLF	(1) ADLF	(6) ADL
U_t	4.380 (1.29)	4.449 (1.31)	5.059 (1.17)	4.885 (1.41)	5.164 (1.50)
x_{ct}	-10.69*** (-4.12)	-8.986*** (-4.40)	-11.37*** (-4.70)	-8.587*** (-3.32)	-8.980*** (-4.15)
x_{ct-1}	10.57*** (3.93)	9.555*** (3.52)	7.916*** (3.32)	9.493*** (3.64)	9.241*** (3.50)

Notes: In the upper panel where Δx_t is used, only the estimated coefficient of U_t is listed and all other estimates are omitted. In the lower panel where x_{ct} is used, only three estimated coefficients are listed and all other estimates are omitted. The regression models are listed in Table 3. The subscripts *, **, and *** indicate the significance at 5%, 1%, and 0.1% level, respectively. The numbers in the parentheses are the robust t statistics based on Newey-West standard errors with a maximum of six lags.

that the changes in short-term interest rates are higher during the weak dollar period (D_{5t}). These short-term interest rates include: Fed Fund rate (FEDF), 3-month and 6-month treasury bill rates (TB3 and TB6), 1-month, 2-month, and 3-month commercial paper rates (FN1M, FN3M, CP30, CP60, and CP90), prime rate (PR), 1-month, 3-month, 6-month Eurodollar deposit rates (UR30, UR18, and UR90), and one-year treasury rate (GS1). For the long-term interest rates, they all have a negative change during the strong dollar period (D_{1t}). These long-term interest rates are: 2-year, 3-year, 5-year, 7-year, and 10-year treasury rates (GS2, GS3, GS5, GS7, and GS10). For the 2-year treasury rate, it also shows a positive change during the weak dollar period (D_{5t}).

The link between exchange rates and interest rates extends to two different markets. In the goods market, weak dollar induces more U.S. exports and less imports. Their impacts on the demand for U.S. money depend on the elasticities of demand for exports and imports. Similar to the Marshall-Lerner condition, when these elasticities are larger enough, the demand for money increases and drives up short-term interest rates, which gives a negative relationship between exchange rates and interest rates. In the financial markets with the emphasis on the return on the financial assets, high domestic interest rates in the U.S. financial markets attract the inflow of foreign investment funds and drives up the dollar index based on UIP, which gives a positive relationship. Furthermore, dollar exchange rate affects not only exports but also affects credit conditions for working capital (Bruno et al., 2018). A strong dollar is associated with tighter credit and stronger working capital, which induces higher interest rates and gives a positive relationship between exchange rates and interest rates. Due to two opposite forces, the relationship between exchange rates and interest rates can be either positive or negative. Deciding whether there is a positive or a negative relationship is an empirical question. Our results support the negative relationship as described in the goods market. However, the negative relationship is asymmetric to the short-term and long-term rates; the negative relationship appears during the weak dollar period only for short-term rates and appears during the strong dollar period only for long-term rates. The decline in long rates during strong dollar periods seems to indicate there is less demand for investment funds; corporations specially multinationals may be postponing their investments for the long rates to settle down.

Table 5 Regressions with Ten Subperiods for Monthly Series

Series	FEDF	TB3	GM6	FN1M	FN3M
D_{5t}	0.119* (2.24)	0.109* (2.21)	0.103* (2.16)	0.126* (2.10)	0.106* (2.05)
Series	CP30	CP60	CP90	PR	GS1
D_{5t}	0.131* (2.18)	0.130* (2.21)	0.138* (2.18)	0.106* (2.25)	0.111* (2.13)
Series	UR30	UR90	UR18		
D_{5t}	0.149* (2.23)	0.147* (2.20)	0.140* (2.07)		
Series	GS2	GS3	GS5	GS7	GS10
D_{1t}	-0.0816 (-1.69)	-0.0892 (-1.96)	-0.0938* (-2.05)	-0.0924* (-2.00)	-0.0808 (-1.73)
D_{5t}	0.0810 (1.71)				
Series	Dow Jones	S&P 500	Oil Price	M2	M3
U_{5t}		-13.91 (-1.88)	-25.37 (-1.80)		
D_{1t}		-16.71 (-1.70)			
D_{4t}				-1.225** (-2.68)	-1.223** (-2.68)
U_{1t}	10.14 (1.92)	10.98* (2.50)			
U_{2t}	8.030 (1.66)	9.557* (2.03)			
Series	INDPRO	DSPIC	HHCNF	UMCsent	UNRATE
U_{4t}	1.881 (1.95)	2.253* (2.58)	3.305*** (4.20)	1.214* (2.23)	
U_{5t}					0.0720* (2.51)
D_{1t}					0.0749* (2.04)
D_{2t}	2.513** (2.69)		3.489*** (4.31)		
D_{3t}					0.0440** (2.60)
D_{5t}	2.091* (2.32)		2.605*** (3.52)		
U_{2t}			3.195*** (3.39)	1.379** (2.61)	

Notes: Only the significant coefficients of U_{it} and D_{it} are listed and all other estimates are omitted. See notes in Table 4.

A summary of other monthly series with significant coefficients during different phases of the appreciation/depreciation periods is as follows.

1) The growth rates of Dow Jones Industrial Average and S&P 500's are around 10% higher during and right after the weak dollar periods (U_{1t} and U_{2t}) or the initial stages of appreciation. The growth of S&P 500 is 13.9% and 16.7% lower during the strong dollar periods (U_{5t} and D_{1t}). Using different methods, Ajayi et al. (1998) found stock returns Granger cause exchange rates unidirectionally in eleven of fourteen countries and exchange rates Granger cause stock returns only in one country (Korea), whereas Inci and Lee (2014) found that lagged exchange rates have a significant impact on stock returns. Our results suggest a negative relationship between exchange rates and the growth rate of stock returns.
2) The growth rate of oil price is 25.37% lower during the strong dollar period (U_{5t}). This represents lower oil prices due to lower import cost in the strong dollar period.
3) The growth rate of money supply, both M2 and M3, is about 1.22% lower before the weak dollar period (D_{4t}). This tighter money supply may be related to the higher short-term interest rates during the weak dollar period (D_{5t}).
4) The growth rate of industrial production index (INDPRO) and the disposable income (DSPIC), and the changes in Consumer Confidence index (HHCNF) and consumer sentiment index (UMCsent) are higher before the strong dollar period (U_{4t}). Industrial production index and consumer confidence index are also higher after the strong dollar period (D_{2t}) and during the weak dollar period (D_{5t}). Both the changes in Consumer Confidence index and consumer sentiment index are higher after the weak dollar period (U_{2t}).
5) The change in the unemployment rate (UNRATE) is higher by 0.07% during the strong dollar periods (U_{5t} and D_{1t}). It is also higher by 0.04% in the middle of the depreciation period (D_{3t}).

The results for the growth of output and consumer confidence level, and the change in unemployment are consistent. The high output growth coexists with the positive change in consumer confidence level; the positive change in unemployment rate appears only during the periods when there is no higher growth of output and consumer confidence.

We apply the autoregressive distributed lag and lead model (Equation (2)) with x_{ct} to each of the 38 quarterly series. When only U_t is used in the regression as in Equation (2), none of the series shows significant estimate for U_t. This implies that the differentiation of appreciation and depreciation periods has no impact on each series, and we find the same results for both monthly and quarterly series. To further examine strong/weak dollar effects, we divide each appreciation and depreciation period into three subperiods, and replace the constant term and U_t in Equation (2) by the dummy variables U_{q1t}, U_{q2t}, U_{q3t}, D_{q1t}, D_{q2t}, and D_{q3t} to control three subperiods for each appreciation/depreciation period. Table 6 summarizes the results for those series with significant coefficients for the selected dummy variables from the general-to-specific approach. It shows that the growth rate of three exports series (EX_GSI, EX_GS, and EX_G) are higher during the weak dollar period (D_{q3t}) and in the middle of depreciation period (D_{q2t}). Five imports series (IM_GSI, IM_GS, IM_G, IM_PI, and IM_INV) also have higher growth rate during the weak dollar period (D_{a3t}).

It is well known that weaker dollar implies stronger foreign currencies, and stronger or higher purchasing power for them and therefore higher U. S. exports and lower U.S. imports. The positive coefficients for the export variables during the weak dollar period are consistent with theoretical expectations, but the positive coefficients for import variables are not. Both higher growth rate of exports and imports of goods and services during the weak dollar period imply high level of international trade during the weak dollar period. This leads to high growth of industrial production and stock prices. The higher growth of import income payments (IM_PI and IM_INV) during the weak dollar period represents a better investment opportunity for foreign investors to receive income payments with weak dollar.

Table 6 Regressions with Six Subperiods for Quarterly Series

Series	EX_GSI	EX_GS	EX_G		
D_{q2t}	3.214 (1.69)	4.308* (2.18)	5.335* (2.19)		
D_{q3t}	4.513* (2.10)	5.140* (2.26)	7.099* (2.49)		
Series	IM_GSI	IM_GS	IM_G	IM_PI	IM_INV
D_{q3t}	4.086* (2.00)	4.131* (2.20)	4.799* (2.23)	12.94* (2.00)	13.26* (2.01)
Series	ACQU	AQINV_D	AQINV_O	LIAB	LBINV_O
D_{q1t}	1213.5* (2.59)				
D_{q2t}		213.5* (2.05)			
D_{q3t}			815.3* (2.18)	681.4* (2.34)	
U_{q2t}		87.26 (1.96)			-506.8* (-2.51)
Series	BCA_GS	PCE	GCE	EXPORTS	OPHR
U_{q3t}			2.877** (2.80)		2.748*** (4.12)
D_{q1t}		1.010 (1.69)	2.392* (2.11)		3.336*** (3.59)
D_{q2t}			1.145 (1.71)	2.331 (1.84)	1.819** (3.23)
U_{q2t}	145.5 (1.80)	0.788* (2.00)	1.817* (2.52)		1.514* (2.14)

Notes: All coefficients are significant at 5% level for the one-tailed test. See notes in Table 4. The subscripts *, **, and *** indicate the significance at 5%, 1%, and 0.1% level, respectively. The numbers in the parentheses are the robust *t* statistics based on Newey-West standard errors with a maximum of four lags.

A summary of other quarterly series with significant coefficients for the selected dummy variables is as follows.

1) The growth of net acquisition of financial assets (ACQU) is higher during the strong dollar period (D_{q1t}). A strong dollar is often associated with stronger capital outflows and leads to higher purchasing power of the dollar. Thus, U. S. multinationals end up spending more on acquiring foreign physical assets, and leading to possible increased merger activity.
2) The growth of net acquisition of foreign direct investment (AQINV_D) is higher in the middle of depreciation and appreciation periods (D_{q2t} and U_{q2t}). The growth of net acquisition of other investment (AQINV_O) is higher during the weak dollar period (D_{q3t}).
3) The growth of net incurrence of liabilities (LIAB) is higher during the weak dollar period (D_{q3t}) and the growth of net incurrence of other investment is lower in the middle of appreciation period (U_{q2t}).
4) The growth of the balance on current account of goods and services (BCA_GS) is higher in the middle of appreciation period (U_{q2t}) implying the growth of exports is higher than the growth of imports in the middle of the appreciation period and generates higher growth of current account balance.
5) The growth of personal consumption expenditure (PCE), the government expenditure (GCE), and real output per hour (OPHR) are higher in the periods other than the weak dollar periods (D_{q3t} and U_{q1t}).

We note that the estimated coefficients for some series (ACQU, AQINV_D, AQINV_O, LIAB, LBINV_O, and BCA_GS) are unusually large, which indicates the capture of the unusual movements of the series. The use of quarterly data with three dummy variables in each appreciation and depreciation period may be inappropriate for these series.

CONCLUSIONS

In this study, we have addressed the implications of strong versus weak dollar on the U. S. economic fundamentals. Based on the unique time series properties of exchange rates, we use the Hodrick-Prescott filter to identify long-term cycles of U.S. dollar index. The long-term cycles are characterized by two peaks and three troughs between January 1974 and July 2019. From these peaks and troughs, we define dollar appreciation and depreciation periods in the long-term. By dividing each of the appreciation and depreciation into several subperiods, we conduct the detailed analysis of the impacts of strong and weak dollar on macroeconomic fundamentals.

Using U.S. dollar index and 72 macroeconomic variables for the sample period, we show that various macroeconomic fundamentals respond differently during different phases of appreciation and depreciation periods. The results provide meaningful and interesting interpretations more for monthly data than for quarterly data. A weak dollar is associated with a positive change in short-term interest rates and a strong dollar is associated with a negative change in long-term interest rates. A strong dollar comes with higher increase in unemployment rate and does not go together with positive change in the consumer confidence, higher growth rates of industrial production, personal consumption, government expenditures, and output per hour.

Compared to other current studies, the empirical modelling used in this study is unique in two respects. First, it is important to note that our model is not based on the predictivity of exchange rates. There are some limitations in using the HP filter (Hamilton, 2018). One is that the estimation algorithm of the HP filter requires the use of the future data in the sample to "smooth" the series in the long run. This implies that the estimated long-run pattern may depend on the addition of new data. Furthermore, the inclusion of the distributed lag and lead variables of the growth rates of exchange rates for the short-term estimation cannot be used for forecast. Hence, no conclusions can be drawn for the purpose of forecasting as in the standard use of the HP filter. However, our results support the fundamental economic relationships between exchange rates and several macroeconomic variables. The evidences of the relationship between exchange rates and the macroeconomic variables, such as interest rates and real outputs, provide important policy implications. Based on the negative relationship between strong/weak dollar and interest rates, a monetary policy may be formed during the strong and weak dollar periods to target on interest rates. Since strong dollar may induce a high unemployment rate, government policies aiming to relieve unemployment issues should be considered during the strong dollar period. Second, our model relates both long-term and short-term impacts from exchange rates to macroeconomic variables. The main reason to use the HP filter for exchange rates is not to derive the cyclical component. It is used to derive long-term cycles for strong and weak dollar analyses. This use of the HP filter is different from most other studies, where their emphases are on the cyclical component. In sum, our model delivers an alternative empirical approach to integrate both short-term and long-term analyses of the exchange rates. Our results provide additional empirical evidence to the literature on the interactions between exchange rates and macroeconomic fundamentals.

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APPENDIX

Table A1 Data Series Codes and Descriptions

Series Code	Descriptions
	Monthly Series
TWEXBPA	Real Trade Weighted U.S. Dollar Index: Broad, Goods
FEDF	Effective Federal Funds Rate (FYFF)
TB3	3-Month Treasury Bill: Secondary Market Rate (TB3MS)
TB6	6-Month Treasury Bill: Secondary Market Rate (FYGM6)
FN1M	AA Financial Commercial Paper Interest Rate, 30 Day
FN3M	AA Financial Commercial Paper Interest Rate, 90 Day
CP30	AA Nonfinancial Commercial Paper Interest Rate, 1-Month
CP60	AA Nonfinancial Commercial Paper Interest Rate, 2-Month
CP90	AA Nonfinancial Commercial Paper Interest Rate, 90 Day
PR	Bank Prime Loan Rate (Period Average)

GS1	1-Year Treasury Constant Maturity Rate (GS1)
GS2	2-Year Treasury Constant Maturity Rate (GS2)
GS3	3-Year Treasury Constant Maturity Rate (GS3)
GS5	5-Year Treasury Constant Maturity Rate (GS5)
GS7	7-Year Treasury Constant Maturity Rate (FYGT7)
GS10	10-Year Treasury Constant Maturity Rate (GS10)
CM	Mortgage Rates, 30-Year Fixed-Rate (FRM)
UR30	Eurodollar Deposit Rate, 1-Month (Period Average)
UR90	Eurodollar Deposit Rate, 3-Month (Period Average
UR18	Eurodollar Deposit Rate, 6-Month (Period Average)
LCIM127	3-Month LIBOR and Treasury Bill Market Bid Yield Spread
DJIA	Dow Jones Industrial Average
SP500	S&P 500
OILP	U.S. Crude Oil First Purchase Price (Dollars per Barrel)
M2	M2 Money Stock (M2SL)
M3	M3 for the United States (MABMM301USM189S)
REQRES	Required Reserves of Depository Institutions (REQRESNS)
TOTRES	Total Reserves of Depository Institutions (TOTRESNS)
INF	Inflation, Consumer Price Index for All Urban Consumers: All Items
INF_PPI	Inflation-PPI, Producer Price Index
INDPRO	Industrial Production Index (INDPRO)
DSPIC	Real Disposable Personal Income (DSPIC96)
HHCNF	Consumer Confidence Index, Conference Board (1985=100,Sa)
UMCSENT	University of Michigan: Consumer Sentiment (UMCSENT)
UNRATE	Civilian Unemployment Rate (UNRATE)
	Quarterly Series
EX_GSI	Exports of Goods and Services and Income Receipts
EX_GS	Exports of Goods and Services
EX_G	Exports of Goods
EX_S	Exports of Services
EX_PI	Exports of Income Receipts, Primary Income
EX_INV	Exports of Income Receipts, Primary Income, Investment Income
IM_GSI	Imports of Goods and Services and Income Receipts
IM_GS	Imports of Goods and Services
IM_G	Imports of Goods
IM_S	Imports of Services
IM_PI	Imports of Income Payments, Primary Income
IM_INV	Imports of Income Payments, Primary Income, Investment Income
IM_SI	Imports of Income Payments, Secondary Income Payments
ACQU	Net U.S. acquisition of financial assets excluding financial derivatives
AQINV_D	Net U.S. acquisition of financial assets – Direct investment
AQINV_P	Net U.S. acquisition of financial assets – Portfolio investment
AQINV_O	Net U.S. acquisition of financial assets – Other investment

AQRES	Net U.S. acquisition of financial assets – Reserve assets
LIAB	Net U.S. incurrence of liabilities excluding financial derivatives
LBINV_D	Net U.S. incurrence of liabilities – Direct investment
LBINV_P	Net U.S. incurrence of liabilities – Portfolio investment
LBINV_O	Net U.S. incurrence of liabilities – Other investment
BCA	Balance on Current Account
BCA_GS	Balance on Current Account, Goods and Services
BCA_G	Balance on Current Account, Goods
BCA_S	Balance on Current Account, Services
BCA_PI	Balance on Current Account, Primary Income
BCA_SI	Balance on Current Account, Secondary Income
LEND1	Net lending/borrowing (+/-) from current- and capital-account transactions
LEND2	Net lending/borrowing (+/-) from financial-account transactions
GDP	Real Gross Domestic Product (GDPC1)
PCE	Real Personal Consumption Expenditures (PCECC96)
GCE	Real Government Consumption Expenditures and Gross Investment
EXPORTS	Real Exports of Goods and Services
IMPORTS	Real imports of goods and services
GDPPC	Real gross domestic product per capita (A939RX0Q048SBEA)
CPATAX	Corporate Profits After Tax
OPHR	Business Sector: Real Output Per Hour of All Persons

Sources: Federal Reserved Economic Data (FRED), Global Insights, and Bureau of Economic Analysis.