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### ECONOMIC HISTORY, FINANCIAL ECONOMICS and INTERNATIONAL MACROECONOMICS

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# ABSTRACT

## Out-of-Sample Evidence on the Returns to Currency Trading*

We document the existence of excess returns to naïve currency trading strategies during the emergence of the modern foreign exchange market in the 1920s and 1930s. This era of active currency speculation constitutes a natural out-of-sample test of the performance of carry, momentum and value strategies well documented in the modern era. We find that the positive carry and momentum returns in currencies over the last thirty years are also present in this earlier period. In contrast, the returns to a simple value strategy are negative. In addition, we benchmark the rules-based carry and momentum strategies against the discretionary strategy of an informed currency trader: John Maynard Keynes. The fact that the strategies outperformed a superior trader such as Keynes underscores the outsized nature of their returns. Our findings are robust to controlling for transaction costs and, similar to today, are in part explained by the limits to arbitrage experienced by contemporary currency traders.

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# 1.    Introduction

Recent research has shown that naïve trading strategies when implemented on a cross-section of currencies yield high excess returns. These strategies are carry, momentum and value which sort currencies according to their interest rate differential, recent returns and undervaluation relative to purchasing power parity respectively. The profitability of these zero-cost strategies constitutes a challenge to finance theory, contradicting both the efficient market hypothesis (EMH) and uncovered interest parity condition (UIP).

Evidence on the returns to carry (Lustig and Verdelhan, 2007, Brunnermeier et al., 2009, Burnside et al., 2010, 2011, Menkhoff et al., 2012a, Jorda and Taylor, 2011, 2012), momentum (Okunev and White, 2003, Gyntelberg and Schrimpf, 2011, Menkhoff et al., 2012b, Jorda and Taylor, 2011, Asness et al., 2013) and value (Jorda and Taylor, 2011, Asness et al., 2013) strategies is based on currency markets since the end of Bretton Woods in the 1970s. The most recent extensions of this literature have shown that these strategies generate excess returns across other asset classes in the same modern era (Asness et al., 2013, Koijen et al., 2013). Doskov and Swinkels (2013) analyze the carry strategy only over the twentieth century using annual returns. However, there has been no detailed study of the returns to currency trading in periods other than the post-Bretton Woods years. The major contribution of this paper is to provide evidence on the returns to currency trading across different time periods.

The one other period of pronounced exchange rate volatility since the emergence of modern foreign exchange markets to set alongside the recent post-Bretton Woods era is that of the 1920s and 1930s. Simple line plots of the continuously quoted spot exchange rates for the US dollar and the Swiss Franc against sterling since 1880 clearly contrast the fixed rate regimes of the Gold Standard (1880-1914) and of the Bretton Woods era (1945-72) with the volatility of the 1920-1939 and post-1973 periods (**Figure 1**). For the purposes of this out-of-sample study, there are important differences between these latter two periods. First, whilst the carry strategy in G10 currencies since 1973 has been dominated by going long the high interest rate AUD and NZD and short the JPY, the long and short portfolios of this strategy in the 1920s and 1930s exhibit much more turnover. Second, the considerable macro-economic fluctuations of the 1920s and 1930s contrasts sharply with the economic stability of the Great Moderation characterizing the post-Bretton Woods period from the early 1980s to the 2008 crisis. Hence, the volatility of US and UK annual real GDP growth

were respectively 8.2% and 5.0% over 1920-1939 compared to 1.8% and 2.3% over 1985-2012.[1] We believe therefore that the 1920s and 1930s constitute an ideal period with which to test the returns to naïve currency trading strategies out of sample.

[Figure 1 about here]

Having compiled a detailed data set of month-end spot and forward foreign exchange rate bid-ask quotations for the 1920s and 1930s, we follow the approach of the recent literature and explore the returns to these strategies in the cross-section of currencies (Lustig and Verdelhan, 2007; Menkhoff et al., 2012a, 2012b). Our main finding is that the outsized returns to the carry and momentum trading strategies present today also exist in the 1920-39 period. Returns to the value strategy were on the other hand consistently poor. Carry and momentum generated particularly high returns in the 1920s, both relative to contemporary stocks and bonds in the same period and to returns to the same currency strategies in the 1990s and 2000s.

In addition, we provide further evidence on the outsized nature of the returns to carry and momentum in the 1920-39 period by benchmarking the performance of these two rules-based strategies against the strategy of a superior trader: John Maynard Keynes. He made full use of the newly-emerged forward market in the 1920s and 1930s to bet on the evolution of spot exchange rates. Keynes had extensive knowledge of the main exchange rates theories of the day, being the first economist to publish an explicit formulation of the covered interest parity (CIP) condition and among the first to present empirical evidence on the purchasing power parity (PPP) theory (Keynes, 1923). Given he was an informed and sophisticated trader with a successful track record in stock trading (Chambers et al., 2013), Keynes was well-placed to exploit any mispricing in currency markets. Moreover, our analysis of his trading style together with his correspondence reveals that Keynes' approach was discretionary and fundamentals-based and orthogonal to the carry, momentum and value strategies. We therefore contend that his trading record constitutes a suitable benchmark for these rules-based strategies. Having compiled a detailed data set of his currency transactions during the 1920s and 1930s, we find that Keynes failed to match the returns to carry and momentum strategies during the whole period. This result further underscores the puzzling nature of the outsized payoffs to these strategies.

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[1] Based on US and UK real GDP data taken from Global Financial Data.

Three main explanations for the excess returns to currency trading strategies in the modern period have been advanced in the literature: high transaction costs (Menkhoff et al. 2012b), limits to arbitrage (Lyons, 2001, Burnside et al., 2011, Menkhoff et al. 2012b) and exposure to systematic risk (Lustig and Verdelhan, 2007, Lustig et al. 2011, Fahri and Gabaix, 2008, Fahri et al., 2009). We estimate that in the 1920s and 1930s transaction costs were not inordinately high compared to the end of the twentieth century and account for no more than one-third of the gross returns to carry and momentum. Furthermore, our analysis suggests that there were limits to arbitrage activity among contemporary investors which may have prevented the elimination of these outsized returns. Finally, we present some evidence in support of the excess returns to the carry trade, but not momentum, covarying with macro-risk factors.

The prior literature has to date focused on two main aspects of the foreign exchange markets in the 1920s and 1930s. First, authors have conducted out-of-sample tests of exchange rates theories on the floating exchange rate era of the 1920s. Taylor and McMahon (1988) examined the validity of the purchasing power parity theory. Peel and Taylor (2002) have explored the covered interest parity condition on the sterling/dollar market. MacDonald and Taylor (1991), Philips et al. (1996), and Diamandis et al. (2008) have tested the forward exchange market efficiency hypothesis. Second, scholars have studied in detail the contribution of exchange rate regimes and exchange rates policies to the Great Depression (Eichengreen, 1992, Temin, 1989, Bernanke, 2000, James, 2001). To the best of our knowledge, we are the first to exploit this important and dynamic period in foreign currency markets to look for out-of-sample evidence on the returns to currency trading.

The remainder of the paper is organized as follows. Section 2 describes the emergence of modern foreign exchange markets in the 1920s. Section 3 discusses our data and sources. Section 4 examines the performance of carry, momentum and value strategies in the 1920s and 1930s. Section 5 describes Keynes' currency trading strategy and compares his discretionary approach with the naïve, rules-based strategies. Section 6 discusses possible explanations for our findings and Section 7 concludes.

## 2.  Foreign Exchange Markets in the 1920s and 1930s

The period of the 1920s and 1930s constitutes an ideal out-of-sample test of currency strategies for two reasons. First, it is the first period of active currency trading following the emergence of the modern foreign exchange market in 1919. Second, this period is characterized by

dramatic exchange rate volatility compared to the Bretton-Woods era which followed, a fact which created large opportunities for currency traders. We discuss each of these points in turn.

## 2.1   The emergence of a modern foreign exchange market

Currency traders in the 1920s and 1930s for the first time traded currencies with the same instruments as are used today. The decade following WW1 saw a profound transformation of foreign exchange markets with London becoming the major center of trading. The end of wartime capital controls in Britain in 1919 was followed by a surge in currency trading activity (Atkin, 2005: pp. 40-41). Transactions in bills of exchange were soon replaced by dealings in telegraphic transfers and the modern spot market with which we are familiar today emerged (Einzig, 1937: p.57). At the same time, a large-scale forward currency market was also established in London. Although forward transactions were undertaken before WW1 in such financial centers as Vienna and Berlin (Miller, 1929: pp. 102-103, Einzig, 1937: p. 37-38, Flandreau and Komlos, 2006), the volume of activity was considerably surpassed by London after 1919.

Both spot and forward currency deals were conducted by telephone between banks and foreign exchange brokers either executing customer orders undertaken for hedging trade or investment transactions, for arbitrage or for speculation (Einzig, 1937: p.85-94). Although currency volumes were not published in the London market in this period, contemporary sources claim that currency trading activity was substantial (Einzig, 1937). An internal Bank of England document dated January 1928 estimated daily foreign exchange turnover on the London market between £4.9 and £5.5 million, equivalent to 30% of British GDP and 20% of the volume of world trade on an annual basis.[2] USD - Sterling £ transactions dominated, representing between 73% and 82% of all transactions. The other major currencies, French franc, German mark, Italian lira, Dutch florin, Belgian franc, Swiss franc, together accounted for between 7% and 11% of currency turnover.

## 2.2   Exchange rate volatility

Compared to the fixed exchange rates periods of 1880-1914 and 1945-1972, the 1920s and 1930s exhibited substantial exchange rate volatility and offered substantial opportunities for currency traders. Whilst our analysis in the rest of the paper examines currency returns across the 1920s and

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[2] The estimate of foreign exchange turnover is from Archives, Bank of England, EID3/281, "Approximate amount of foreign currency changing hands on the London market". The GDP estimate and estimate of the volume of world trade for 1928 are respectively from Mitchell (2007) and Maddison (1995). We assume 250 trading days per year.

1930s as a whole, we also consider returns in each of the following three sub-periods: January 1920 to December 1927, when currencies floated; January 1928 to August 1931, when currencies returned to the gold standard; and September 1931 to August 1939, when currencies were subject to managed floating. Eichengreen (1992, 1998: ch.3) provides detailed background on international finance in this period. Below, we briefly describe each of these sub-periods.

When wartime capital controls were removed in 1919, European governments were forced to float their currencies. This opened an era of floating exchange rates marked by considerable volatility on currency markets. European currencies depreciated sharply against the US dollar in the early 1920s in the face of adverse economic conditions and the failure to resolve the war reparations issue. Germany slid into hyperinflation and lost its currency whilst France experienced two severe speculative attacks. As of 1923 however, most European countries attempted to return to the gold standard. The German stabilization was achieved in 1924 with the help of US credits. Despite Keynes' (1925) criticisms, the British pound returned to gold at its pre-war parity in April 1925 and the French franc was stabilized at a devalued rate at the end of 1926. This period of transition was complete when the Italian lira returned to gold in December 1927. By that time, all major currencies (except the Spanish peseta) had switched from floating to fixed exchange rates.

This return to the gold standard, however, was short-lived. Commodity-exporting developing countries were forced to devalue as early as 1929 in response to ongoing commodity price deflation. The major currencies clung on to gold until banking and balance of payments crises forced first Austria and then Germany to suspend convertibility in July 1931. When the financial crisis in Central Europe moved to London, the speculative pressure on sterling became immense (Accominotti, 2012). The resulting departure of sterling from gold in September 1931 marked the end for the gold standard.

All the major currencies subsequently followed sterling in coming off gold, beginning with the US dollar in April 1933 and ending with France, the Netherlands and Switzerland in September 1936. Although opportunities for currency speculation re-emerged, they were fewer than in the 1920s. Governments opted for managed floating exchange rates with frequent central bank intervention and as a result currencies were less volatile compared to the 1920s. Furthermore, the number of currencies available to be traded decreased as capital controls were imposed on the German mark, the Spanish peseta and Italian lira.

The next section documents more precisely when and where currency trading was feasible.

## 3. Data

### 3.1 Currency excess returns

According to Paul Einzig, the leading foreign exchange commentator of this period, the currencies for which an active forward market existed in the 1920s and 1930s were the Belgian franc (BEF), the Swiss franc (CHF), the German mark (DEM), the Spanish peseta (ESP), the French franc (FRF), the Pound sterling (GBP), the Italian lira (ITL), the Dutch guilder (NLG) and the US dollar (USD) (Einzig, 1937: p. 104). These 9 currencies make up our sample.

For each currency, we assemble a monthly dataset of spot and forward exchange rates (against sterling) quoted in London for 1920-1939. Despite spot rates being published prior to this date, our return estimates start in 1920, the first year in which forward rates become available. Our primary source for exchange rate data is the *Financial Times* and the *Manchester Guardian* supplemented with data from Keynes (1923) and Einzig (1937, pp. 450-481) for 1920-1922. All exchange rates are those for the last trading day of each month, or for the trading day closest to the month-end when none is available.

We believe that it is preferable to use forward exchange rates in estimating currency returns in this period rather than a combination of spot rates and interest differentials, as for example do Doskov and Swinkels (2013). The use of forward-implied interest rate differentials avoids the considerable problems of obtaining risk-free interest rates for comparable short-term investment instruments in all currencies during this period (Einzig, 1937: pp. 265, 277, 295). By focusing on the set of currencies for which an active forward market existed, we make sure that the strategies we study were implementable by investors and we can compute the actual cost of implementation.

**Figure 2** plots the number of currencies in our sample in any given month (solid line) as well as those on the gold standard (dotted line). The variation in sample size is for two reasons. First, we exclude the German mark for all 33 months from February 1922 to October 1924. There were no sterling/mark forward quotations during the German hyperinflation period from September 1923 onwards. In addition, the introduction of restrictions on currency trading activities by the German Government in February 1922 made it extremely difficult to trade the German mark in the run-up to hyperinflation.[3] Second, exchange controls were introduced for the German mark in July 1931, the Spanish peseta in May 1931 and the Italian Lira in May 1934. The number of currencies

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[3] Between 3 February 1922 and 21 December 1923, 44 measures were enacted to restrict foreign currency trading and related activities in Germany. See Reichsregierung (1924). We thank Carsten Burhop for pointing us towards this source.

excluded from the sample in any given month due to the presence of capital controls is highlighted in Figure 2 (shaded area). Hence, out of a theoretical maximum of 2,115 (9 currencies×235 months), we have data for 1,701 currency-months.

[Figure 2 about here]

We also compare our results for 1920-39 with those for the G10 currencies (Australian Dollar, British Pound, Canadian Dollar, German Mark, Japanese Yen, Norwegian Krone, New Zealand Dollar, Swedish Krone, Swiss Franc and US Dollar) in 1985-2012. For the latter period, monthly spot and forward exchange rates (against the US Dollar) are taken from BBI (via Datastream).

[Table 1 about here]

We denote $s$ as the log of the spot exchange rate (in units of foreign currency per sterling pound) and $f$ as the log of the 1-month forward exchange rate (also in units of foreign currency per sterling pound). The forward discount is defined as the log difference between the forward and spot rate $f - s$. The log excess return on buying currency $i$ in period $t$ on the forward market and selling it on the spot market in period $t+1$ is given by:

$$rx_{t+1}^i = f_t^i - s_{t+1}^i \qquad\qquad (1)$$

**Table 1** summarizes the descriptive statistics on the excess returns and forward discounts for each of the nine currencies in our sample.

We also estimate the returns to currency strategies after adjusting for transaction costs in the form of bid and ask quotations. Spot and forward bid–ask spreads are computed as $(S^a - S^b)/S^m$ and $(F^a - F^b)/F^m$ where $S^m$ and $F^m$ are the spot and forward mid-quotes defined respectively as $S^m = (S^a + S^b)/2$ and $F^m = (F^a + F^b)/2$.

Spot rate bid-ask spreads are available across the whole period, whilst those for forward rates are first quoted in May 1922. We estimate forward bid-ask spreads in any given month from January

1920 to April 1922 by adding the mean difference between the forward and spot bid-ask spreads from May 1922 to December 1927 to the spot bid-ask spread at the month-end.

[Table 2 about here]

**Table 2** presents descriptive statistics on bid-ask spreads by currency. Average bid-ask spreads for spot and forward rates in our sample ranged from 5.42 and 7.22 basis points respectively for the US dollar to 19.22 and 26.89 basis points for the Italian lira.

**Figure 3** displays the average spot and forward bid-ask spreads across all currencies in the sample from 1920 to 1939. The graph reveals that transaction costs were low over the 1922-1931 period and increased significantly in the first half of the 1930s. The average spot bid-ask spread fluctuated between 1.4 and 18.1 basis points from May 1922 to August 1931 and then rose sharply to almost 100 basis points in September 1931.  This sharp rise in spreads indicates the extreme shortage of exchange rate liquidity during and after the Sterling Crisis of September 1931.

[Figure 3 about here]

Following Lustig et al. (2011), we define the log excess return of taking a long position in a given currency net of transaction costs as:

$$rx_{t+1}^{l} = f_t^b - s_{t+1}^a \tag{2}$$

where a and b subscripts refer to the bid and ask exchange rate quotations respectively. Similarly, the net log excess return of taking a short position in a given currency is given by:

$$rx_{t+1}^{s} = -f_t^a + s_{t+1}^b \tag{3}$$

Our dataset also includes wholesale prices for the same nine countries for which we have exchange rate data to facilitate estimation of real exchange rates in the manner in which contemporary investors could do so. Monthly wholesale price indices over 1920-1939 were obtained from the NBER Macro-History database for the US, UK and France and sources for Germany, the Netherlands, Italy, Belgium, Spain and Switzerland include the League of Nations'

*Statistical Year-Book*, the *Federal Reserve Bulletin*, the *International Abstract of Economic Statistics* (International Conference of Economic Services, 1934, and International Institute of Statistics, 1938), Keynes (1923), Swiss National Bank (1944) and Holtfrerich (1986).[4] For the 1985-2012 period, we use monthly consumer price indices from the IFS database and the OECD's Main Economic Indicators.

## 3.2   Keynes' currency trading

The research question of this paper is whether or not the outsized returns of naïve carry, momentum and value strategies present today were also to be found in the 1920s and 1930s. In answering this question, we compare these strategies to that of an informed, sophisticated and well-connected currency trader of this period, John Maynard Keynes. Hence, we employ a second data set, the detailed and complete trading record of Keynes, who traded currencies on his own account from August 1919 to April 1927 and then again from October 1932 to February 1939.

Typically, Keynes took out a forward contract to buy or sell a currency and then chose one of three options: (i) to close the position with a spot purchase in the days immediately before the delivery date; (ii) to close the position well before the delivery date; and (iii) to maintain the position by continuing the forward position. He recorded all his spot and forward purchases in his personal investment ledgers kept in the archives at King's College, Cambridge. In total, we compiled 354 currency trades on his personal account. For each spot and forward transaction, we record the date of the transaction, the nominal value of the contract, and the exchange rate versus sterling at which he contracted. For each forward transaction, we also record the date on which delivery was to take place and from the latter we calculate the duration of each of his forwards.

**Table 3** summarizes all his currency trades. For each year, we report the number of trades in each currency, the average sterling value and the average duration in number of days of the nominal forward position. In the 1920s, he mainly traded US dollars (USD), German marks (DEM), French francs (FRF), and Italian lira (ITL) versus the sterling pound (GBP). We do not believe Keynes employed currency overlay strategies. In the 1920s, his stock portfolio consisted almost entirely of UK stocks; in the 1930s, whilst he did have a substantial long position in US stocks, his writings give no indication at all of the pursuit of an overlay strategy.

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[4] We are grateful to Jan Annaert for providing us with data for Belgium in 1921-1922.

Consistent with our discussion in the previous section, Keynes's investment opportunity set shrank in the 1930s due to the introduction of exchange and capital controls. He only traded 3 currencies, USD, FRF and the Dutch florin (NLG) against sterling (GBP) and his trading was dominated by his USD position. He did not trade the Belgian franc, Spanish peseta or Swiss franc in either the 1920s or 1930s.

We supplement the detailed transaction-level data with a careful analysis of Keynes' currency views drawn from his correspondence located in the archives of King's College Cambridge and at the British Library's manuscripts section.

The *Collected Writings of John Maynard Keynes* ("CWK") and Moggridge (1982: 5-6 , 1992) discuss Keynes' speculation in currencies together with his close friend and stock broker O.T. Falk from February to May 1920 on behalf of a syndicate comprising their own capital and that of friends and family (CWKXII: p.5-6). This syndicate ran up considerable losses and was forced to close down in May 1920. The trading positions of the syndicate are similar to his own positions in this period. Whilst Keynes also traded currencies for the King's College, Cambridge endowment, he only traded during the 1930s and again his trading positions were very similar to those on his own account.

# 4.    The Performance of Carry, Momentum and Value, 1920-1939

## 4.1  Currency Portfolios

In this section, we document the performance in the 1920s and 1930s of the main naïve currency trading strategies: carry, momentum and value. In doing so, we follow the recent literature and explore the returns to these strategies in the cross-section of currencies (Lustig and Verdelhan, 2007, Lustig et al., 2011, Menkhoff et al. 2012a, 2012b). We construct monthly portfolios of currencies sorted on currency characteristics.

At the end of each period $t$, we rank the nine currencies in our sample according to carry, momentum and value criteria. We then construct two currency portfolios at the end of each period $t$ as follows. The *High* portfolio is formed from the two highest ranking currencies and the *Low* portfolio from the two lowest ranking currencies. We compute the log excess return on the

*High* and *Low* portfolios, $rx_{t+1}^H$ and $rx_{t+1}^L$ respectively, by equally weighting the log excess returns on the individual currencies in each portfolio. The portfolios are rebalanced every month.

Finally, we compute the monthly excess returns on the strategy, $rx_{t+1}^{HL}$, which takes a long position in the *High* portfolio and a short position in the *Low* portfolio at the end of each month:

$$rx_{t+1}^{HL} = rx_{t+1}^H - rx_{t+1}^L \qquad\qquad (4)$$

We next define each of the three currency strategies.

## 4.2  Carry

The carry strategy ($CARRY$) ranks currencies according to their forward discount against sterling: $f - s$. When covered interest parity (CIP) holds, the forward discount is equal to the interest rate differential: $f - s = i^* - i$, where $i^*$ and $i$ are respectively the foreign and domestic risk-free nominal interest rates over the same horizon as the forward exchange rate. Therefore, the strategy is equivalent to borrowing in low interest rate currencies and investing in high interest rate currencies when CIP holds.

There is evidence that deviations from CIP were arbitraged between the London and New York markets during the 1920s when an annualized profit of at least 0.5% was available (Peel and Taylor, 2002). However, as mentioned in section 3.1, risk-free interest rates for comparable short-term investment instruments are not available for all currencies in our sample during the period and we therefore sort currencies by their forward discounts rather than their interest rate differentials. The carry strategy exploits deviations from UIP at short-term horizons and, more precisely, the fact that high interest rate currencies tend to depreciate less than their interest rate differential (Froot and Thaler, 1990).

## 4.3  Momentum

Momentum strategies rank currencies according to their past performance. We consider a set of momentum strategies ($MOM_k$) which sort each currency *i* by its spot exchange rate appreciation against sterling over the previous $k$ months: $s_{t-k}^i - s_t^i$. We report below the performance of these strategies for $k =1$ and 3 months. These strategies take a long position in currencies which have appreciated and a short position in currencies which have depreciated against sterling and are

equivalent to buying past winners and selling past losers. There is evidence that stock market investors employed such trend-following techniques during the 1920s and 1930s (Schabaker, 1932, Gartley, 1935). While we have failed to uncover references to currency traders employing similar techniques, it is conceivable that speculators in currency markets adopted similar rules.

Momentum can also be defined in terms of high past excess return from buying a currency forward and selling it spot as discussed above (Burnside et al., 2011, Menkhoff et al., 2012b). Hence, we also explored the performance of a momentum strategy ($RMOM$) ranking currencies according to their previous month's excess return: $rx_t^i = f_{t-1}^i - s_t^i$. The performance of the $RMOM$ strategy is similar to the other momentum strategies. We do not report these results here but they are available on request.

## 4.4 Value

The value strategy ($VALUE$) ranks currencies according to their real exchange rate undervaluation. The real exchange rate undervaluation of currency *i* relative to sterling is defined as $q_t^i - \bar{q}^i$, where $q_t^i$, the log of the real exchange rate, is equal to $s_t^i + p_t^{UK} - p_t^i$; $p_t^{UK}$ and $p_t^i$ are respectively the logs of the UK and local price indices; and $\bar{q}$ is the long run equilibrium real exchange rate.

The strategy therefore takes a long position in undervalued currencies and a short position in overvalued currencies. The underlying assumption is that exchange rates tend to revert towards their long-run value which is typically defined in terms of purchasing power parity (PPP). Thanks to Cassel (1918), currency speculators were aware of PPP theory by the start of our sample period and used PPP as a benchmark for their currency investments (Einzig, 1937: 278). Furthermore, Taylor and McMahon (1988) report evidence that PPP held as a long-run equilibrium condition during the floating exchange rate period of the 1920s.

In order to estimate the real exchange rate, $q_t^i$, we assume investors made use of the monthly wholesale price indices published in contemporary sources. Following Cassel (1919) and Keynes (1923), we set the long run equilibrium real exchange rate, $\bar{q}$, for the 1920s and 1930s equal to the real exchange rate in 1913, as this was the benchmark contemporaries had in mind for assessing the validity of the PPP condition.

We also consider an alternative value strategy employed by Asness et al. (2013) over the period 1979-2011 which ranks currencies according to the 5-year change in their purchasing power

parity. The 5-year change in PPP is defined as the log change in the spot exchange rate over the previous 5 years minus the log change in foreign prices relative to UK prices over the same period: $s_t^i - s_{t-5y}^i - \left(p_t^i - p_t^{UK}\right) + \left(p_{t-5y}^i - p_{t-5y}^{UK}\right)$. Given that wholesale price index data are unavailable before August 1919, we are only able to estimate the returns for this strategy starting in September 1924. The results are very similar to those obtained when using 1913 as the PPP benchmark and are available on request.

## 4.5   Performance

Before computing any returns, we first analyze the frequency with which each currency enters the *High* and *Low* portfolios for each of the three strategies over the 1920-1939 and 1985-2012 periods (**Table 4).** In both periods, the pursuit of momentum returns implied rebalancing the long and short portfolios frequently, whilst pursuing a value strategy implied much less portfolio turnover. However, there is a striking difference between the two periods in the case of the rebalancing of the *High* and *Low* carry portfolios. The carry strategy in G10 currencies over 1985-2012 generally involved shorting the Japanese Yen and Swiss Franc, 86.31% and 69.64% of the time respectively, and investing in the New Zealand and Australian Dollars, 72.92% and 47.02% of the time respectively. In contrast, there was no such clear distinction between funding and investment currencies in 1920-1939, the *High* and *Low* carry portfolios being rebalanced across currencies much more frequently.

[Table 4 about here]

**Table 5** summarizes the performance of the carry, momentum and value strategies for the period January 1920 to July 1939 (panels A to D). For each, we report the mean annualized return over the period, the annualized standard deviation of returns, the annualized Sharpe ratio, as well as the skewness and kurtosis of monthly returns. We compare performance with the excess return on UK stocks, represented by the total return on the equally-weighted 100 Share UK equity index series estimated by Dimson Marsh and Staunton (DMS) (2002), and on UK government bonds in excess of the UK one-month Treasury bill rate. We report performance for the whole period 1920-39 (**Panel A**) as well as for the floating exchange rate period, January 1920 to December 1927

(**Panel B**), the return to the gold standard period, January 1928 to August 1931 (**Panel C**) and the managed floating exchange rate period, September 1931 to July 1939 (**Panel D**).

In addition, we compare performance with that of the same strategies implemented on the G10 currencies during the 1985-2012 period (**Panel E**). In estimating the performance of the value strategy over 1985-2012, we follow Jorda and Taylor (2011, 2012). We set the long-run equilibrium real exchange rate $\bar{q}$ equal to the lagged average real exchange rate (against the US Dollar) computed over the period 1975-1984 using consumer price indices and substitute the EUR/USD exchange rate for the German Mark after 1999 at a conversion rate of 1.95583.

[Table 5 about here]

The striking result from **Table 5** is that the naïve carry and momentum strategies which have gained popularity in recent years also performed very well in this pre-Bretton Woods era. Over the whole sample period 1920-1939, the $CARRY$ strategy returns on average +10.11% and the returns to $MOM_1$ and $MOM_3$ strategies are +12.47% and +9.59% respectively (Panel A). Carry and momentum strategies display higher Sharpe Ratios (0.57, 0.63 and 0.50) than those available on alternative assets, UK stocks (0.31) and UK bonds (0.36).

Carry and momentum strategies all exhibit higher returns over 1920-1939 than over 1985-2012 (Panel E).[5] The $CARRY$ strategy exhibits a similar Sharpe Ratio over the 1920-39 period (0.57) to that over the 1985-2012 period (0.56); the Sharpe ratios on $MOM_1$ and $MOM_3$ (0.63 and 0.50) in 1920-1939 exceeded by a large margin those of the recent period (0.24 and 0.31).

In line with the previous results of Jorda and Taylor (2011, 2012), the $VALUE$ strategy exhibits a high average return (+4.30%) and Sharpe ratio (0.46) over 1985-2012 when implemented on the G10 currencies (Panel E). However, taking long positions in undervalued currencies and shorting overvalued currencies did not pay off in the 1920s and 1930s. We find that the currency value strategy yielded a highly negative monthly return of -8.67% during 1920-39. An alternative version of this strategy ranking currencies according to the 5 year change in their PPP value also performs poorly (results available on request).

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[5] Increasing the number of currencies in the sample significantly improves the performance of carry and momentum strategies during the recent period. Menkhoff et al. (2012b) find that a carry trade strategy implemented on 48 currencies over the 1983-2009 period yields a Sharpe ratio of 0.74. Menkhoff et al. (2012a) find a Sharpe ratio of 0.95 for a 1-month momentum strategy implemented on a sample of 48 currencies during the years 1976 to 2010.

**Figure 4** displays the cumulative excess returns of the $CARRY$ and $MOM_1$ strategies, over the entire period 1920-39 against those on UK stocks.  Most of the gains to these two strategies were made in the period 1920-27, when the returns to $CARRY$, $MOM_1$ and $MOM_3$ were very high, +24.73%, +21.61% and +19.54% respectively (**Table 5, Panel B**). During this same period, the $VALUE$ strategy performed the worst, -20.63%.


[Figure 4 about here]


In general the returns to currency strategies were also high during the gold standard period, January 1928 - August 1931. Although almost all currencies in our sample had a fixed parity with gold during those years, the Spanish Peseta (ESP) never returned to the gold standard and continued floating against the other currencies (**Table 5, Panel C**).

The UK's departure from gold in September 1931 marked the beginning of a new era of currency volatility (**Table 5, Panel D**). However, the three currency trading strategies did not perform particularly well during the 1930s compared to UK stocks or bonds. The $CARRY$ strategy yields a return of only -3.73%. Returns on $MOM_1$ and $MOM_3$ are positive (+6.48% and +4.74% respectively), yielding lower Sharpe ratios (0.51, 0.56) than UK stocks (0.71) but slightly higher than UK bonds (0.47). The $VALUE$ strategy continued to generate negative returns in the 1930s (-2.34%).

The highly negative skewness for the $CARRY$ strategy and highly positive skewness for the $MOM_1$ strategy in the 1930s suggest that their performance was affected by a few large exchange rates swings during the period. In these years when currency speculation mainly consisted in betting against fixed exchange rates, the precise timing of an individual currency's departure from the gold standard affected the returns to these strategies substantially.

Next, we examine returns after taking transaction costs into account. **Table 6** shows the performance of the currency strategies after adjusting for bid-ask spreads. Despite transaction costs reducing the gross returns to the $CARRY$, $MOM_1$ and $MOM_3$ strategies by 3.46%, 3.27% and 3.25% respectively across the whole period 1920-1939, net returns on these strategies (6.65%, 9.20% and 6.34%) remain  positive (Panel A).

Although in the 1930s net returns to the carry trade are disappointing (-7.77%) and returns to the two momentum strategies are only slightly positive (+2.81%, +1.21%) (Panel B), this period of

poor returns fails to offset the high net returns to these strategies during the 1920s (Panel C). As a result, across the whole period 1920-39, the cumulative returns to carry and the two momentum strategies net of transaction costs are still higher than the gross returns on UK stocks and bonds and their Sharpe ratios (0.38, 0.47 and 0.33) exceed those of UK stocks (0.31) in all cases and UK bonds (0.36) in two out of the three cases.

[Table 7 about here]

How correlated are these currency strategy returns over 1920-1939 compared to 1985-2012? There is no correlation between carry and momentum returns (0.07) in the earlier period (**Table 7**, Panel A). Similarly, our estimated correlation for the G10 currencies (-0.06) over 1985-2012 in the recent period (Panel E) is consistent with the findings of Menkhoff et al. (2012a). This is clear evidence supporting the claim that carry and momentum are diversifying strategies.

[Table 6 about here]

Value returns are negatively correlated with carry returns (-0.38) and momentum returns (-0.33) over 1920-39. By contrast, there is a positive correlation (0.36) between value and carry returns over 1985-2012 and no correlation (-0.05) between value and momentum returns. When decomposing across sub-periods, there is also some instability in the coefficients. Hence, we see that the correlation between carry and momentum is positive (0.17) in 1920-27 but becomes negative (-0.47) in 1931-39. Similarly, value and momentum returns are negatively correlated (-0.56) in 1920-1927, but become positively correlated (0.64) in 1931-39.

## 5.   Benchmarking Carry, Momentum and Value

We next compare the carry, momentum and value strategies with that of a prominent trader of the 1920s and 1930s: John Maynard Keynes. Keynes' strategy provides us with a suitable benchmark for the three strategies for two main reasons. First, Keynes was a superior currency manager: he was an informed trader and an expert on currency markets and exchange rates theory. Evidence of his success as a stock investor also suggests he had superior trading skills, was innovative in his approach and demonstrated a considerable willingness to learn from experience

(Chambers and Dimson, 2013, Chambers, Dimson and Foo, 2013). Second, Keynes' currency strategy was discretionary and fundamentals-based and orthogonal to the rules-based carry, momentum and value strategies. Benchmarking Keynes' returns against carry, momentum and value returns therefore provides an additional perspective on the performance of these naïve, rules-based currency strategies.

## 5.1  An Informed Trader

Keynes was continuously active on currency markets from August 1919 to April 1927 and then again from October 1932 to February 1939. The analysis of his correspondence reveals that he was both an informed and a sophisticated currency trader.

Keynes undoubtedly leveraged his contacts when forming his currency views. For example, one exchange of letters with his close friend and investment partner, O.T. Falk, refers to a private lunch in September 1919 with US diplomats and bankers at the center of international financial negotiations at the Versailles Conference. Falk's impression was that "it [was] less likely than ever that the Americans [would] grant large scale credits to Europe at an early date" (King's Archives, PP/JMK/SE/2/1/13-14). This view confirmed Keynes' own concerns about the performance of European economies and currencies struggling under the reparations burden. Another letter dated June 1924 refers to Keynes having dinner with the director of Westminster Bank (one of the largest British banks), who "gave [him] to understand that the governor strongly sympathise[d]" with the idea of raising the discount rate in order to support sterling in its return to the gold standard (British Library, Add. Ms57923, 20 June 1924).

Later on, he became a well-known public figure on both sides of the Atlantic. He sat on the important MacMillan Committee on Finance and Industry advising the British government from 1929-31 and met with a large number of US policy-makers, including Roosevelt himself on his visits in 1931 and 1934. In all probability, Keynes was at certain times able to access private information unavailable to the majority of traders. He, for example, became aware of Britain's imminent departure from gold in September 1931, although he refused to short sterling (CWK XII: 35).

However, on other occasions, his status and connections appeared not to be of any benefit to his currency trading. In the 1930s, he struggled to understand US official policy. Hence, as we discuss in the next section, he closed out his short position in US dollars completely unaware of Roosevelt's decision to devalue against gold in March 1933. Then, based on his reasoning that it was "difficult to see how a creditor country can keep its currency depreciated", he went long the

following month (King's Archives, PP/BM/70-72). A little later, he confessed that "I am still very much in the dark and apart from the opinions in the press have nothing to help me except my own ideas" (King's Archives, PP/BM/78-79).

## 5.2 A Sophisticated Trader

Keynes also attempted to exploit his considerable knowledge of currency markets when trading currencies. As with stock markets, he was intellectually fascinated by foreign exchange markets and wrote in considerable detail about them (Keynes, 1923: chapter 4). His writings indicate that his currency trading was based on a discretionary analysis of macro-economic fundamentals.

His exchange of letters with Falk in 1919 and 1920 (King's Archives, PP/JMK/SE/2) clearly illustrates his focus on such macro-economic fundamentals as expected changes in official interest rates, the level of European reparations and international capital flows and the inflation outlook. This remained his primary focus throughout his currency trading career. In February 1932, Keynes produced his most detailed investment note – a note on the sterling exchange rate for the board of a large UK-quoted closed-end fund – which provides the best example of his fundamentals-based approach (King's Archives, PP/BM/6/6-18). In it, he calibrates his own expectations relative to the consensus as to future changes in the UK trade account and invisibles account and in capital transactions. In addition, his note also discusses the interventionist policies of both the Bank of England and places great weight on its willingness to intervene in support of sterling.

There is no discussion at all in this detailed memorandum or any other correspondence of carry, momentum or value strategies.

## 5.3 Keynes' Currency Trading Positions

We compute Keynes' monthly positions in individual currencies from his currency transaction record by marking-to-market his positions in each currency using end-of-month forward exchange rates. His cumulative gross (long and short) position across all foreign currencies in pounds sterling from August 1919 to March 1939 is summarized in **Figure 5.** His position fluctuated between zero and £100,000 over 1919-1927 and between zero and £250,000 over 1932-1939. The higher level of activity in the 1930s compared with the 1920s reflects Keynes increased personal wealth which averaged over £150,000 in the 1930s compared to slightly more than £40,000 in the 1920s (CWK XII: 11, Table 3).

A total of 343 out of his 354 transactions were in five currencies: the DEM, FRF, GBP, ITL, NLG and USD. From January 1920 to May 1927 he traded the DEM, FRF, GBP, ITL, and USD and from October 1932 to March 1939 the FRF, GBP, NLG and USD. We breakdown Keynes' monthly positions into longs (+) and shorts (-) by individual currency (**Figure 6**). We infer his long (short) GBP position from his net short (long) position in all other currencies. In 1919-1927 (Panel A), Keynes constantly shorted the French franc, German mark and Italian lira from 1919 to 1925 with few exceptions, whilst his trading of the US dollar appears more tactical. In general, he was long the US dollar and sterling in this period, but briefly adopted a short dollar position in 1921, 1922 and 1924. In 1932-1939 (Panel B), he mainly traded in the US dollar where he alternated between short and long positions. His other trades were short positions in the French franc and the Dutch florin from mid-1933 until September 1936, balanced by a long position in sterling.

**Figure 7** plots his position in each currency traded against each spot exchange rate against sterling. His short positions in the French franc, German mark and Italian lira in April and May 1920 proved disastrous as all three currencies strengthened against sterling (**Figure 7 (ii), (iii), (iv)**). However, his resumption of these short positions almost immediately proved profitable when all three depreciated. They then continued to be profitable as they fell over the first half of the 1920s, the exception being the German mark, where he closed out his short in July 1921 being unable to trade this currency in any size.

His trading of the US dollar in the 1930s bears out the difficulties he had understanding US official policy (**Figure 7 (v)**). Having shorted the dollar in October 1932-February 1933, he closed his position on 2 March 1933, just eight days before the suspension of the US dollar's gold convertibility. Believing the depreciation following departure from the gold standard to be overdone, he went long the dollar between April and June 1933 only to see the currency continue to depreciate. Although he switched to shorting the dollar in July, his positions were of modest size when the exchange rate reached its low of $5.20 against sterling in November. Thereafter, although

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he consistently adopted a short position increasing to a maximum in December 1936, the dollar fluctuated around the $5.00 level.

Expecting both to follow the US dollar off gold, he shorted the French franc and Dutch florin from March 1933 to December 1933, only to be frustrated by the franc remaining stable and the florin strengthening (**Figure 7 (vi) and (vii)**). After a pause, he resumed his short positions in July 1934 and consistently added to them until in September 1936 both were eventually devalued and he was able to show a profit on both trades. These trades illustrate well the challenges he faced in the timing of his currency forecasts where he was off by several years. He himself recognized this challenge in December 1934 stating that:

"Nothing is more rash than a forecast with regard to dates on this matter. The event when it comes will come suddenly. The best thing is to allow for probability and put little trust in forecasts of the date, whether soon or late" (King's Archives, BM/1/178)

[Figure 7 about here]

The qualitative evidence reviewed above indicates that Keynes based his currency trading on a discretionary analysis of macro-economic fundamentals. There is no reference to his following a carry or momentum strategy in his writings and, whilst his *Tract on Monetary Reform* indicates his familiarity with PPP measures of currency values, he does not seem to have followed a rules-based value approach. This is confirmed by our analysis of his trading record. Over the whole period he traded, Keynes' currency positions rarely matched those of carry, momentum and value strategies. We find that the percentage of months in which he was long at least one of the *High* portfolio currencies and short at least one of the *Low* portfolio currencies for the carry, momentum and value strategies was 14.55%, 16.97% and 23.64% respectively. Keynes' trading approach was therefore orthogonal to these rules-based currency investment strategies.

## 5.4  Comparison of Carry, Momentum and Value Strategies against Keynes

Given he was an informed trader and an expert on currency markets, Keynes would seem to have had a better than average chance of succeeding as a currency trader. Was he able to beat the rules-based carry, momentum and value strategies? In this section, we benchmark these strategies against Keynes.

We first estimate Keynes' cumulative gains and losses in sterling pounds from August 1919 to May 1927 and from October 1932 to March 1939 (**Figure 8**). Consistent with the description of his trading in section 5.2, his shorting continental European currencies and going long the US Dollar registered a substantial loss of £21,000 in May 1920, when European currencies appreciated against sterling, forcing him into a cumulative loss of £11,000. Thereafter, his unchanged currency views were correctly borne out over the rest of the 1920s and he recovered to make a cumulative profit of £14,600 by the time he stopped trading in 1927. A similar pattern emerges in the 1930s. His bets against the French franc and Dutch florin incurred cumulative losses of £6,000 by the end of August 1936. However, when both currencies were devalued the following month he recovered to a cumulative gain of £10,000.

[Figure 8 about here]

Next, we convert Keynes' monthly gains and losses in sterling pounds into a rate of return. Keynes did not operate a fund and his own financial records do not permit the estimation of the equity he allocated to his currency trading. We infer his notional equity from the 20 per cent margin typically required by his broker on his forward currency transactions. Hence, we estimate Keynes' equity as 20 per cent of his maximum gross position in each of the 1920s and 1930s. Whilst the assumed level of implied equity affects any estimate of his average return and standard deviation, it does not affect the Sharpe ratio.

**Table 8** compares the carry, momentum and value strategy returns with those on Keynes' strategy. We present the results over the entire period during which Keynes traded and when forward exchange rates data are available (**Panel A**) as well as for the two sub periods January 1920 to May 1927 (**Panel B**) and October 1932 to March 1939 (**Panel C**).

The results reveal that the carry strategy (+8.66%) and the two momentum strategies, $MOM_1$ and $MOM_3$ (+12.91 and +9.32%), outperformed Keynes (+5.39%), whilst the naive value strategy (-16.38%) underperformed (**Panel A**). The Sharpe ratios of the carry strategy (0.43) and the two momentum strategies (0.57 and 0.42) were also superior to that of Keynes (0.16), as was the proportion of months generating a positive return (% Months Up). Keynes' strategy particularly suffered by having the largest maximum monthly loss (-107.03%), almost four times the next worst strategy.

[Table 8 about here]

When we decompose returns into the two sub-periods, the outperformance of the carry strategy in particular is concentrated in the 1920s (**Panel B**). During the 1930s (**Panel C**), the carry strategy did poorly (-6.63%) due to those high-yielding currencies fighting to stay on the gold standard ultimately capitulating and devaluing. Keynes took the opposite approach to the carry strategy and his eventual success in shorting the FRF and NLG in 1936 enabled him to generate returns of +2.46%. Notwithstanding poor performance in the 1930s, carry still generated returns superior to Keynes' strategy over the whole period. In contrast, momentum ($MOM_1$) did relatively well across both decades, continuing to outperform (+5.91%) in the 1930s relative to Keynes and the other factors.

Following Pojarliev and Levich (2008, 2010, 2012), we regress Keynes' returns against a factor model including the returns on the carry, momentum and value factors represented by our estimated returns to the three naïve trading strategies over the whole period. If Keynes was following any of the three naïve strategies we would expect both a good fit from this regression and the factor loadings to be consistently positive and statistically significant. Whilst the loadings on carry and momentum are positive they are not statistically significant. The loading on the value factor is the wrong sign. The R-squared of 0.20 for the full model regression over the whole period confirms that only a small part of Keynes' sophisticated and discretionary strategy can be accounted for by the three factors. These results are available on request.

In summary, following naïve carry and momentum strategies would have generated much higher returns in the 1920s while taking substantially less risk than Keynes' alternative discretionary, fundamentals-based strategy. In the 1930s, when absolute returns in currency markets were generally lower, the carry strategy underperformed Keynes' strategy but the margin of underperformance was modest compared to the outperformance in the 1920s. The performance of carry and momentum across the whole period relative to the record of an informed and sophisticated trader such as Keynes only underlines the outsized nature of the returns of these two naïve strategies.

## 6. Discussion

How can we explain the outsized returns to carry and momentum in the 1920s and 1930s?

There are three main explanations for the excess returns to carry and momentum in the literature. One explanation rationalizes these returns in terms of high transaction costs. As we saw when comparing the performance before and after transaction costs (Tables 5 and 6), excess returns to these two strategies remain substantial even when we account for bid-ask spreads.

In this section, we discuss two other common explanations, namely, the common risk factors in currency markets and the limits to arbitrage.

## 6.1   Common risk factors in currency returns

Similar to other asset returns, recent currency returns are thought to depend upon the existence of common risk factors (Lustig and Verdelhan, 2007, Lustig et al. 2011, Menkhoff et al., 2012b, Fahri and Gabaix, 2008, and Fahri et al., 2009). Researchers have tried to explain these excess returns to carry and momentum as compensation to investors for exposure to these risk factors. We therefore consider whether excess returns to the carry and momentum strategies in the 1920s and 1930s covary with business cycle, stock market and foreign exchange market risk factors uncovered in the modern period.

Our empirical strategy is to examine whether there are risk factors for which the excess returns to carry and momentum have statistically significant betas. Hence, we estimate these betas by running univariate time-series regressions of the excess returns for each of carry and momentum on a range of macroeconomic and other conventional risk factors: the change in *The Economist* Index of UK Business Activity (BUSINESS); the change in *The Economist* Index of UK Employment (EMPLOYMENT); the UK CPI inflation rate; the TED spread defined as the difference between the 3-month UK prime bill discount rate and the 3-month Treasury bill rate (TED); the term spread defined as the difference between the UK Consol bond yield and the 3-month Treasury bill rate (TERM); and the UK stock market proxied by the DMS Index returns.[6] Unfortunately, there are no monthly or quarterly data on UK consumption expenditure in this period.

We also follow Menkhoff et al. (2012a) and construct a global foreign exchange volatility index equal to the average monthly volatility of daily spot returns of all currencies in our sample.

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[6] The index of UK business activity and CPI index are from Capie and Collins (1983) and the UK employment index is from *The Economist* (various issues). The UK 3-month prime bill discount rate is from International Conference of Economic Services (1934) and International Institute of Statistics (1938) and the UK 2.5% consol rate and 3-month T-bill rate are from Global Financial Data.

Then we estimate an AR(1) for the volatility level index and measure volatility innovations as the residuals (FXVOL).[7]


[Table 9 about here]


**Table 9** summarizes the results. The beta coefficients are in general statistically insignificant. The notable exception is the betas on BUSINESS and EMPLOYMENT which are positive and statistically significant in the carry returns regression. This suggests that carry returns covary with business cycle risk. Hence, for example, the carry trade performed very poorly during early 1921 and mid-1926, the two most severe contractions in the UK economy during the period. In the latter case, between March and July 1926, the carry strategy recorded a cumulative drawdown of -37.0%, the worst in the whole period, reflecting a severe contraction of 66.1% in business activity over the same 5 months. Whilst it is possible that carry returns can be partly explained as compensation for consumption growth risk consistent with the finding of Lustig and Verdelhan (2007), factors other than consumption affect the business cycle. Furthermore, some caution is required in interpreting our results given that the regression R-squared's are extremely low.

Our regressions of carry and momentum returns on Fama-French factors, Rm-Rf, SMB and HML, for US stocks over the 1926-39 period also generate statistically insignificant betas (results available on request).


## 6.2   Limits to arbitrage

Limits to arbitrage have been put forward by several authors as a rationale for both carry and momentum excess returns (Lyons, 2001, Burnside et al., 2011, Menkhoff et al. 2012b). The limits to arbitrage hypothesis states that the capacity of currency traders to arbitrage away positive payoffs to carry and momentum strategies requires a longer investment horizon than they generally possess in order to withstand time variation in returns.


[Figure 9 about here]

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[7] Daily spot exchange rates are from Global Financial Data.

**Figure 9** charts the average returns to the carry ($CARRY$) and momentum ($MOM_1$) strategies over rolling 36-month windows. Whilst the net returns to $CARRY$ are consistently positive through the 1920s, they are much more volatile in the 1930s. From September 1931 onwards, the rolling 36-month return is only positive in 9 out of a total of 95 months.

The rolling 36-month net returns to $MOM_1$ are volatile throughout the 1920s and 1930s. After consistently recording large positive monthly net returns in excess of 1% throughout 1923 and 1924, the strategy returns swing between positive and negative returns. Returns then stabilize under during the gold standard period (1928-31). Thereafter, net returns are consistently negative during 1932-33 and again in 1936 before recording positive returns in 1937-39.

Overall, the pattern in returns to both these strategies are indicative of the likelihood that currency traders may well have been unable to ride out periods of trading losses and thereby may have found it too risky to engage in arbitrage activity. For example, the currency trading syndicate Keynes ran in parallel with trading on his own account was closed down by his broker in June 1920 following substantial losses in the previous two months.

# 7.   Conclusion

Recent empirical research has consistently demonstrated the positive returns to simple zero-cost currency speculation strategies such as carry and momentum during the post-Bretton Woods era. This result remains a challenge to finance theory. Our paper provides the first study of the returns to foreign exchange speculation in the 1920s and 1930s – a period when modern currency speculation utilizing spot and forward foreign exchange rates first emerged.

We provide out-of-sample evidence that the returns to the same carry and momentum strategies well-documented in the post-1973 period also existed in the 1920-39 period. Carry and momentum strategies yielded particularly high returns during the 1920s. Although returns were disappointing during the managed float period of the 1930s when currency markets suffered numerous speculative attacks and sudden devaluations, we discover substantial excess returns to carry and momentum over the whole period 1920-39. Both strategies performed similarly or better than UK stocks and bonds over this period whilst being consistently uncorrelated with either. In addition, carry and momentum outperformed the discretionary, fundamentals-based trading approach of an informed and sophisticated trader such as Keynes. This result further underlines the outsized nature of the payoffs to these naïve strategies.

We also address the ongoing debate in the literature as to why carry and momentum strategies have performed so well in the post-Bretton Woods period. Some authors claim that returns to naïve currency speculation strategies compensate investors for risk, whilst others claim transaction costs and limits to arbitrage are more important. Our paper makes a contribution to this debate by subjecting these explanations to out-of-sample data. We estimate that transaction costs explain no more than one-third of the excess returns to carry and momentum during the 1920-39 period. Furthermore, we present evidence to suggest that limits to arbitrage are a likely explanation for the observed excess returns after transaction costs. Last, although we are hindered by data limitations, we provide some evidence that the returns to the carry trade covary with macro-risk factors. Hence, it is possible that in the case of the carry strategy investors were being compensated for the considerable macro-economic volatility they experienced in the 1920s and 1930s.

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**Table 1. Descriptive Statistics: Excess Returns and Forward Discounts**

Panel A summarizes descriptive statistics of excess returns and forward discounts for 8 exchange rates against the sterling pound in the period 1920-1939: the Belgian Franc (BEF), Swiss Franc (CHF), German Mark (DEM), Spanish Peseta (ESP), French franc (FRF), Italian Lira (ITL), Dutch florin (NLG) and US Dollar (USD). Panel B summarizes descriptive statistics of excess returns and forward discounts for 9 exchange rates against the USD constituting the G10 currencies in the period 1985-2012: the Australian Dollar (AUD), Canadian dollar (CAD), Swiss Franc (CHF), German Mark (DEM), Pound sterling (GBP), Japanese Yen (JPY), Norwegian Krone (NOK), New Zealand Dollar (NZD) and Swedish Krone (SEK). Annualized monthly excess returns (%) and forward discounts (%) are computed using spot and forward exchange rates against the sterling pound for 1920-1939 and against the US Dollar for 1985-2012. Sources: see text.

| CURRENCY | PERIOD | EXCESS RETURN (%) | | | | FORWARD DISCOUNT (%) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MEAN | SD | MIN | MAX | MEAN | SD | MIN | MAX |
| PANEL A: | 1920-1939 | | | | | | | | |
| BEF | 1921:02-1939:07 | -4.15 | 17.34 | -315.57 | 261.76 | 1.13 | 1.73 | -8.60 | 60.93 |
| CHF | 1922:01-1939:07 | 0.71 | 10.98 | -396.98 | 264.89 | 0.49 | 1.08 | -4.32 | 42.23 |
| DEM | 1920:04-1922:02 1924:12-1931:07 | -18.40 | 29.07 | -594.04 | 441.88 | -0.17 | 0.96 | -12.81 | 3.70 |
| ESP | 1925:12-1931:05 | -11.27 | 14.97 | -266.08 | 105.74 | -1.83 | 0.38 | -4.32 | 1.59 |
| FRF | 1920:01-1939:07 | -4.11 | 20.90 | -384.52 | 343.10 | 3.36 | 2.44 | -5.97 | 62.19 |
| ITL | 1920:01-1934:05 | 0.13 | 19.42 | -303.71 | 260.97 | 1.32 | 1.83 | -9.25 | 48.79 |
| NLG | 1921:02-1939:07 | 2.29 | 8.48 | -227.77 | 259.94 | 0.90 | 1.00 | -2.49 | 34.61 |
| USD | 1920:01-1939:07 | -0.69 | 9.27 | -161.21 | 256.78 | 0.39 | 0.48 | -2.43 | 11.26 |
| PANEL B: | 1985-2012 | | | | | | | | |
| AUD | 1985:01-2012:12 | 4.10 | 12.06 | -205.12 | 110.08 | 3.28 | 0.85 | -7.70 | 12.43 |
| CAD | 1985:01-2012:12 | 1.80 | 7.14 | -151.26 | 108.26 | 0.78 | 0.51 | -4.34 | 8.56 |
| CHF | 1985:01-2012:12 | 2.02 | 12.03 | -142.17 | 151.51 | -1.72 | 0.77 | -12.00 | 11.05 |
| DEM | 1985:01-2012:12 | 2.20 | 11.13 | -132.07 | 112.43 | -0.49 | 0.74 | -10.46 | 6.81 |
| GBP | 1985:01-2012:12 | 3.24 | 10.35 | -151.70 | 164.68 | 2.03 | 0.67 | -7.48 | 10.34 |
| JPY | 1985:01-2012:12 | 1.17 | 1.15 | -128.59 | 186.63 | -2.64 | 0.92 | -21.55 | 26.80 |
| NOK | 1985:01-2012:12 | 3.96 | 10.96 | -153.81 | 88.17 | 2.21 | 1.11 | -33.18 | 21.32 |
| NZD | 1985:01-2012:12 | 6.46 | 12.45 | -160.50 | 149.87 | 4.49 | 1.35 | -3.82 | 36.55 |
| SEK | 1985:01-2012:12 | 2.82 | 11.56 | -186.06 | 105.97 | 1.67 | 0.97 | -13.44 | 23.19 |

**Table 2. Descriptive Statistics: Bid-Ask Spreads (in basis points)**

Panel A summarizes descriptive statistics of bid-ask spreads (in basis points) for the 8 spot exchange rates against GBP from January 1920 to July 1939 and for their forward exchange rates against GBP from May 1922 to July 1939. We indicate in the table where bid-ask quotations are only available for shorter periods. Panel B summarizes descriptive statistics of bid-ask spreads (in basis points) for the 9 spot and forward exchange rates against the USD (the G10 currencies) in the period 1985-2012. Monthly bid-ask spreads are computed using spot and forward exchange rates against the pound sterling for 1920-1939 and against the US Dollar for 1985-2012. Sources: see text.

| CURRENCY | SPOT BID-ASK (B.P.) | | | | | FORWARD BID-ASK (B.P.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PERIOD | MEAN | SD | MIN | MAX | PERIOD | MEAN | SD | MIN | MAX |
| PANEL A: | 1920-1939 | | | | | 1922:05-1939:07 | | | | |
| BEF | 1921:02-1939:07 | 10.98 | 16.63 | 0.36 | 178.57 | 1922:05-1939:07 | 17.58 | 23.21 | 2.44 | 146.92 |
| CHF | 1922:01-1939:07 | 10.89 | 20.33 | 0.99 | 250.00 | 1925:12-1939:07 | 18.27 | 28.29 | 1.98 | 250.00 |
| DEM | 1920:04-1922:02 1924:12-1931:07 | 15.37 | 25.66 | 1.22 | 131.58 | 1926:07-1931:07 | 8.03 | 3.42 | 2.44 | 14.71 |
| ESP | 1925:12-1931:05 | 9.66 | 5.66 | 2.91 | 22.99 | 1925:12-1931:05 | 13.58 | 5.82 | 5.14 | 26.32 |
| FRF | 1920:01-1939:07 | 8.74 | 7.07 | 0.81 | 51.28 | 1922:05-1939:07 | 15.08 | 12.85 | 1.77 | 102.83 |
| ITL | 1920:01-1934:05 | 19.22 | 17.04 | 2.15 | 103.09 | 1922:05-1934:05 | 26.89 | 28.33 | 3.23 | 200.00 |
| NLG | 1921:02-1939:07 | 9.90 | 17.59 | 1.03 | 148.15 | 1923:07-1939:07 | 16.34 | 21.85 | 2.06 | 172.06 |
| USD | 1920:01-1939:07 | 5.42 | 6.55 | 0.64 | 51.02 | 1922:05-1939:07 | 7.22 | 8.16 | 1.28 | 51.02 |
| PANEL B: | 1985-2012 | | | | | 1985:01-2012:12 | | | | |
| AUD | 1985:01-2012:12 | 10.66 | 6.33 | 4.10 | 74.40 | 1985:01-2012:12 | 13.97 | 7.54 | 6.10 | 80.00 |
| CAD | 1985:01-2012:12 | 6.55 | 4.67 | 3.60 | 82.00 | 1985:01-2012:12 | 8.67 | 2.48 | 0.00 | 25.80 |
| CHF | 1985:01-2012:12 | 7.62 | 7.29 | 3.10 | 80.90 | 1985:01-2012:12 | 10.97 | 9.32 | 5.20 | 151.50 |
| DEM | 1985:01-2012:12 | 5.43 | 3.55 | 1.50 | 46.70 | 1985:01-2012:12 | 6.73 | 3.55 | 2.60 | 49.30 |
| GBP | 1985:01-2012:12 | 5.79 | 8.02 | 1.90 | 138.90 | 1985:01-2012:12 | 7.39 | 11.55 | 2.50 | 209.10 |
| JPY | 1985:01-2012:12 | 7.28 | 2.15 | 3.90 | 24.80 | 1985:01-2012:12 | 10.11 | 2.29 | 4.70 | 27.30 |
| NOK | 1985:01-2012:12 | 7.26 | 3.90 | 3.20 | 33.70 | 1985:01-2012:12 | 15.50 | 9.38 | 8.70 | 166.00 |
| NZD | 1985:01-2012:12 | 17.36 | 13.86 | 5.80 | 172.20 | 1985:01-2012:12 | 24.91 | 22.27 | 9.80 | 221.70 |
| SEK | 1985:01-2012:12 | 10.44 | 3.99 | 4.50 | 34.10 | 1985:01-2012:12 | 15.85 | 4.61 | 9.10 | 42.20 |

# Table 3. Descriptive Statistics: Keynes' Currency Trades, 1919-1939

Reported are the number of trades (N), the average trade size (SIZE£), and the average duration of forward contracts (DAYS). "Other" includes Rupees, Norwegian Krone and Danish Krone. Source: see text.

| | ALL | | | USD | | | FRF | | | DEM | | | ITL | | | NLG | | | OTHER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | SIZE£ | DAYS | N | SIZE£ | DAYS | N | SIZE£ | DAYS | N | SIZE£ | DAYS | N | SIZE£ | DAYS | N | SIZE£ | DAYS | N | SIZE£ | DAYS |
| 1919-1938 | 354 | 8203.0 | 106 | 138 | 9622.8 | 128 | 97 | 7773.7 | 86 | 40 | 3210.7 | 60 | 39 | 6842.7 | 98 | 29 | 8328.8 | 149 | 11 | 9099.5 | 98 |
| 1919-1927 | 176 | 7702.7 | 81 | 28 | 12996.8 | 77 | 55 | 6722.7 | 84 | 40 | 3210.7 | 60 | 39 | 6842.7 | 98 | 3 | 13906.1 | 26 | 11 | 9099.5 | 98 |
| 1932-1938 | 178 | 8697.7 | 132 | 110 | 8763.9 | 141 | 42 | 9150.1 | 88 | 0 | - | - | 0 | - | - | 26 | 7686.9 | 164 | 0 | - | - |
| 1919 | 33 | 12185.1 | 42 | 10 | 15333.8 | 49 | 9 | 11909.5 | 34 | 3 | 3644.6 | 84 | 6 | 10550.0 | 31 | 3 | 13892.2 | 26 | 2 | 12837.0 | 38 |
| 1920 | 49 | 10062.2 | 53 | 3 | 20066.6 | 60 | 10 | 12058.2 | 68 | 22 | 3788.0 | 47 | 12 | 8135.8 | 46 | 0 | - | - | 2 | 23177.2 | 55 |
| 1921 | 33 | 3542.7 | 107 | 9 | 2658.7 | 90 | 4 | 4339.0 | 146 | 11 | 3012.2 | 77 | 5 | 4568.8 | 128 | 0 | - | - | 4 | 4912.0 | 161 |
| 1922 | 12 | 6150.5 | 139 | 1 | 33296.3 | 61 | 5 | 3648.9 | 113 | 2 | 270.3 | 62 | 4 | 5431.1 | 229 | 0 | - | - | 0 | - | - |
| 1923 | 22 | 6635.4 | 117 | 3 | 16520.7 | 146 | 10 | 5373.6 | 107 | 2 | 242.0 | 60 | 7 | 6028.2 | 135 | 0 | - | - | 0 | - | - |
| 1924 | 18 | 5665.7 | 92 | 2 | 21793.7 | 91 | 11 | 3203.7 | 86 | 0 | - | - | 2 | 7368.0 | 138 | 0 | - | - | 3 | 2806.1 | 82 |
| 1925 | 3 | 5411.8 | 69 | 0 | - | - | 3 | 5411.8 | 69 | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - | - |
| 1926 | 5 | 546.0 | 95 | 0 | - | - | 3 | 389.2 | 94 | 0 | - | - | 2 | 781.3 | 97 | 0 | - | - | 0 | - | - |
| 1927 | 1 | 2873.6 | 91 | 0 | - | - | 0 | - | - | 0 | - | - | 1 | 2873.6 | 91 | 0 | - | - | 0 | - | - |
| 1932 | 2 | 4617.2 | NA | 2 | 4617.2 | NA | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - | - |
| 1933 | 16 | 4597.1 | 93 | 5 | 3142.9 | 95 | 9 | 5437.0 | 93 | 0 | - | - | 0 | - | - | 2 | 4452.8 | NA | 0 | - | - |
| 1934 | 25 | 6574.2 | 100 | 17 | 5615.5 | 93 | 6 | 9794.1 | 92 | 0 | - | - | 0 | - | - | 2 | 5063.4 | 185 | 0 | - | - |
| 1935 | 51 | 7580.3 | 123 | 28 | 6676.6 | 126 | 13 | 10196.0 | 94 | 0 | - | - | 0 | - | - | 10 | 6710.3 | 151 | 0 | - | - |
| 1936 | 47 | 12836.3 | 139 | 21 | 16453.4 | 161 | 14 | 10290.0 | 79 | 0 | - | - | 0 | - | - | 12 | 9477.0 | 172 | 0 | - | - |
| 1937 | 14 | 13086.8 | 183 | 14 | 13086.8 | 183 | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - | - |
| 1938 | 23 | 5562.6 | 160 | 23 | 5562.6 | 160 | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - | - |

**Table 4. Currency composition of long short portfolios for carry momentum and value strategies**

For each period (1920-1939 and 1985-2012) and each strategy (CARRY, MOM1 and VALUE), the table reports the percentages of months in which each currency is included in the *High* and *Low* portfolios.

| CURRENCY (%) | CARRY | | MOM1 | | VALUE | |
|---|---|---|---|---|---|---|
| | HIGH | LOW | HIGH | LOW | HIGH | LOW |
| PANEL A: 1920:01-1939:07 | | | | | | |
| BEF | 24.26 | 17.02 | 25.53 | 30.64 | 64.26 | 0.43 |
| CHF | 10.64 | 35.74 | 25.53 | 22.98 | 0.00 | 61.28 |
| DEM | 23.40 | 8.09 | 8.94 | 10.64 | 9.36 | 9.36 |
| ESP | 0.00 | 22.13 | 10.21 | 15.32 | 0.43 | 16.60 |
| FRF | 43.83 | 15.32 | 23.40 | 34.47 | 34.04 | 5.11 |
| GBP | 11.06 | 22.13 | 29.36 | 21.70 | 31.49 | 25.53 |
| ITL | 36.60 | 24.68 | 19.15 | 26.38 | 51.06 | 0.00 |
| NLG | 21.28 | 22.13 | 29.79 | 15.74 | 0.00 | 57.87 |
| USD | 28.94 | 32.77 | 28.09 | 22.13 | 9.36 | 23.83 |
| PANEL B: 1985:01-2012:12 | | | | | | |
| AUD | 47.02 | 1.19 | 28.27 | 25.00 | 75.30 | 0.00 |
| CAD | 1.79 | 8.33 | 22.32 | 20.83 | 28.87 | 2.68 |
| CHF | 0.60 | 69.64 | 22.92 | 19.35 | 0.00 | 30.06 |
| DEM | 1.79 | 17.86 | 14.58 | 15.18 | 10.12 | 0.00 |
| GBP | 21.73 | 1.19 | 15.48 | 16.67 | 0.00 | 37.80 |
| JPY | 0.60 | 86.31 | 24.70 | 27.38 | 0.30 | 79.46 |
| NOK | 25.30 | 0.30 | 12.80 | 13.99 | 0.00 | 0.00 |
| NZD | 72.92 | 0.00 | 26.19 | 21.43 | 1.19 | 38.39 |
| SEK | 19.94 | 3.87 | 14.88 | 15.48 | 59.23 | 0.00 |
| USD | 8.33 | 11.31 | 17.86 | 24.70 | 25.00 | 11.61 |

**Table 5. Carry, Momentum and Value Returns 1920-1939 and 1985-2012**

Panels A to D summarize the performance of carry, momentum and value strategies implemented on the sample of 9 currencies (BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG and USD) between January 1920 and August 1939. At the end of each month, we rank the 9 currencies in our sample according to carry, momentum and value criteria. The carry strategy (CARRY) ranks each currency according to their forward discount against sterling. The momentum strategy ranks each currency by its spot exchange rate appreciation against sterling over the previous 1 month (MOM1) or 3 months (MOM3). The value strategy (VALUE) ranks each currency according to their real exchange rate undervaluation. When estimating the (VALUE) strategy returns for January 1920 to August 1939, we set the real equilibrium exchange rate equal to the  real exchange rate (against sterling) in 1913. For each of the carry, momentum and value strategies, the *High* portfolio is formed from the two highest ranking currencies and the *Low* portfolio from the two lowest ranking currencies. The log excess return on the *High* and *Low* portfolios is computed by equally weighting the log excess returns on the individual currencies in each portfolio. The return to each strategy is the difference between the log excess return on the *High* and *Low* portfolios. Portfolios are rebalanced every month. STOCKS and BONDS refer to the excess returns on the DMS UK equity index and UK Consol Bond respectively in the period 1920-39 and to the return on the US CRSP VW index and 10-Year US Government Bond in the period 1985-2012. Excess return on stocks and bonds are calculated by deducting the 1-month T-bill rate from the raw total return. Panel E summarizes the performance of the same strategies implemented on the G10 currencies between January 1985 and December 2012. When estimating the VALUE strategy returns for the period 1985-2012, we set the real equilibrium exchange rate equal to the average lagged real exchange rate (against the USD) over the 1975-84 period. Source: see text.

| | | CARRY | MOM1 | MOM3 | VALUE | STOCKS | BONDS |
|---|---|---|---|---|---|---|---|
| PANEL A: | 1920:01-1939:07 | | | | | | |
| BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG, USD | Mean annualized return (%) | 10.11 | 12.47 | 9.59 | -8.67 | 4.22 | 3.17 |
| | Annualized St.Dev. (%) | 17.65 | 19.72 | 19.27 | 19.59 | 13.76 | 8.69 |
| | Skewness | 0.18 | 0.52 | 0.26 | 0.59 | -0.03 | 0.37 |
| | Kurtosis | 8.51 | 5.96 | 5.00 | 11.81 | 1.19 | 3.03 |
| | Sharpe Ratio | 0.57 | 0.63 | 0.50 | -0.44 | 0.31 | 0.36 |
| PANEL B: | 1920:01-1927:12 | | | | | | |
| BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG, USD | Mean annualized return (%) | 24.73 | 21.61 | 19.54 | -20.63 | 7.17 | 1.85 |
| | Annualized St.Dev. (%) | 23.76 | 27.49 | 28.23 | 26.93 | 12.60 | 6.86 |
| | Skewness | 0.51 | -0.12 | -0.06 | 0.07 | -0.27 | 0.91 |
| | Kurtosis | 1.93 | 1.55 | 1.18 | 3.23 | 1.69 | 1.58 |
| | Sharpe Ratio | 1.04 | 0.79 | 0.69 | -0.77 | 0.57 | 0.27 |
| PANEL C: | 1928:01-1931:08 | | | | | | |
| BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG, USD | Mean annualized return (%) | 8.10 | 5.48 | -1.65 | 3.74 | -14.43 | 2.09 |
| | Annualized St.Dev. (%) | 5.12 | 8.23 | 8.40 | 2.77 | 14.90 | 7.69 |
| | Skewness | 0.99 | 2.18 | -2.04 | 0.95 | 0.19 | 0.48 |
| | Kurtosis | 1.41 | 9.13 | 10.53 | 3.41 | 0.87 | 0.29 |
| | Sharpe Ratio | 1.58 | 0.67 | -0.20 | 1.35 | -0.97 | 0.27 |
| PANEL D: | 1931:09-1939:07 | | | | | | |
| BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG, USD | Mean annualized return (%) | -3.73 | 6.48 | 4.74 | -2.34 | 9.87 | 5.00 |
| | Annualized St.Dev. (%) | 12.57 | 12.72 | 8.48 | 14.04 | 13.87 | 10.63 |
| | Skewness | -4.99 | 3.40 | 0.24 | 5.90 | 0.16 | 0.10 |
| | Kurtosis | 33.25 | 29.75 | 8.55 | 51.55 | 1.41 | 2.70 |
| | Sharpe Ratio | -0.30 | 0.51 | 0.56 | -0.17 | 0.71 | 0.47 |
| PANEL E: | 1985:01-2012:12 | | | | | | |
| G10 Currencies | Mean annualized return (%) | 6.17 | 2.47 | 3.37 | 4.30 | 7.35 | 4.42 |
| | Annualized St.Dev. (%) | 11.07 | 10.34 | 11.02 | 9.34 | 15.89 | 7.72 |
| | Skewness | -0.92 | 0.33 | 0.63 | -0.06 | -0.94 | 0.08 |
| | Kurtosis | 2.06 | 2.56 | 3.19 | 1.30 | 2.80 | 0.82 |
| | Sharpe Ratio | 0.56 | 0.24 | 0.31 | 0.46 | 0.46 | 0.57 |

**Table 6. Carry, Momentum and Value Returns After Transaction Costs 1920-39 and 1985-2012**

The table summarizes the performance of CARRY, MOM1, MOM3 and VALUE strategies after adjusting for bid-ask spreads. Panels A to D show the performance implemented on the sample of 9 currencies (BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG and USD) between January 1920 and August 1939. Panel E shows the performance of the same strategies implemented on the G10 currencies between January 1985 and December 2012. Source: see text.

| | | CARRY | MOM1 | MOM3 | VALUE | STOCKS | BONDS |
|---|---|---|---|---|---|---|---|
| PANEL A: | 1920:01-1939:07 | | | | | | |
| BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG, USD | Mean annualized return (%) | 6.65 | 9.20 | 6.34 | -11.81 | 4.22 | 3.17 |
| | Annualized St.Dev. (%) | 17.59 | 19.72 | 19.23 | 19.71 | 13.76 | 8.69 |
| | Skewness | 0.09 | 0.44 | 0.19 | 0.49 | -0.03 | 0.37 |
| | Kurtosis | 8.50 | 5.87 | 4.98 | 11.55 | 1.19 | 3.03 |
| | Sharpe Ratio | 0.38 | 0.47 | 0.33 | -0.60 | 0.31 | 0.36 |
| PANEL B: | 1920:01-1927:12 | | | | | | |
| BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG, USD | Mean annualized return (%) | 20.89 | 17.91 | 15.73 | -24.41 | 7.17 | 1.85 |
| | Annualized St.Dev. (%) | 23.65 | 27.43 | 28.23 | 27.03 | 12.60 | 6.86 |
| | Skewness | 0.44 | -0.17 | -0.10 | 0.00 | -0.27 | 0.91 |
| | Kurtosis | 2.00 | 1.50 | 1.15 | 3.11 | 1.69 | 1.58 |
| | Sharpe Ratio | 0.88 | 0.65 | 0.56 | -0.90 | 0.57 | 0.27 |
| PANEL C: | 1928:01-1931:08 | | | | | | |
| BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG, USD | Mean annualized return (%) | 6.73 | 4.00 | -3.08 | 2.53 | -14.43 | 2.09 |
| | Annualized St.Dev. (%) | 5.09 | 8.22 | 8.41 | 2.74 | 14.90 | 7.69 |
| | Skewness | 0.97 | 2.17 | -2.06 | 0.81 | 0.19 | 0.48 |
| | Kurtosis | 1.45 | 9.08 | 10.61 | 3.48 | 0.87 | 0.29 |
| | Sharpe Ratio | 1.32 | 0.49 | -0.37 | 0.93 | -0.97 | 0.27 |
| PANEL D: | 1931:09-1939:07 | | | | | | |
| BEF, CHF, DEM, ESP, FRF, GBP, ITL, NLG, USD | Mean annualized return (%) | -7.77 | 2.81 | 1.21 | -5.73 | 9.87 | 5.00 |
| | Annualized St.Dev. (%) | 12.58 | 12.88 | 8.33 | 14.16 | 13.87 | 10.63 |
| | Skewness | -4.94 | 3.18 | -0.05 | 5.80 | 0.16 | 0.10 |
| | Kurtosis | 32.53 | 29.13 | 8.46 | 50.57 | 1.41 | 2.70 |
| | Sharpe Ratio | -0.62 | 0.22 | 0.15 | -0.40 | 0.71 | 0.47 |
| PANEL E: | 1985:01-2012:12 | | | | | | |
| G10 Currencies | Mean annualized return (%) | 3.36 | 0.08 | 0.99 | 1.96 | 7.35 | 4.42 |
| | Annualized St.Dev. (%) | 11.06 | 10.34 | 11.03 | 9.33 | 15.89 | 7.72 |
| | Skewness | -0.94 | 0.31 | 0.62 | -0.07 | -0.94 | 0.08 |
| | Kurtosis | 2.08 | 2.53 | 3.20 | 1.27 | 2.80 | 0.82 |
| | Sharpe Ratio | 0.30 | 0.01 | 0.09 | 0.21 | 0.46 | 0.57 |

**Table 7. Correlation of Carry, Momentum and Value Returns, 1920-1939 and 1985-2012**

The table summarizes the pair wise correlation coefficients between the monthly returns to CARRY, MOM1 and VALUE strategies as defined in Table 5. STOCKS and BONDS refer to the excess returns on the DMS UK equity index and UK Consol Bond respectively in the period 1920-39 and to the return on the US CRSP VW index and 10-Year US Government Bond in the period 1985-2012. *, **, *** indicate significance at the 10%, 5%, and 1% levels respectively. Source: see text.

| | | CARRY | MOM1 | VALUE | STOCKS | BONDS |
|---|---|---|---|---|---|---|
| PANEL A: | 1920:01-1939:07 | | | | | |
| BEF, CHF, | CARRY | 1.00 | 0.07 | -0.38*** | -0.06 | -0.04 |
| DEM, ESP, | MOM1 | | 1.00 | -0.33*** | -0.01 | -0.02 |
| FRF, GBP, | VALUE | | | 1.00 | 0.03 | 0.09 |
| ITL, NLG, | STOCKS | | | | 1.00 | 0.31*** |
| USD | BONDS | | | | | 1.00 |
| PANEL B: | 1920:01-1927:12 | | | | | |
| BEF, CHF, | CARRY | 1.00 | 0.17 | -0.33*** | -0.09 | -0.19* |
| DEM, ESP, | MOM1 | | 1.00 | -0.56*** | -0.01 | -0.06 |
| FRF, GBP, | VALUE | | | 1.00 | 0.03 | 0.17 |
| ITL, NLG, | STOCKS | | | | 1.00 | 0.29*** |
| USD | BONDS | | | | | 1.00 |
| PANEL C: | 1928:01-1931:08 | | | | | |
| BEF, CHF, | CARRY | 1.00 | 0.19 | 0.36** | -0.12 | -0.07 |
| DEM, ESP, | MOM1 | | 1.00 | 0.11 | -0.25 | -0.04 |
| FRF, GBP, | VALUE | | | 1.00 | -0.01 | 0.06 |
| ITL, NLG, | STOCKS | | | | 1.00 | 0.17 |
| USD | BONDS | | | | | 1.00 |
| PANEL D: | 1931:09-1939:07 | | | | | |
| BEF, CHF, | CARRY | 1.00 | -0.47*** | -0.55*** | -0.01 | 0.15 |
| DEM, ESP, | MOM1 | | 1.00 | 0.64*** | 0.02 | 0.05 |
| FRF, GBP, | VALUE | | | 1.00 | 0.10 | 0.04 |
| ITL, NLG, | STOCKS | | | | 1.00 | 0.38*** |
| USD | BONDS | | | | | 1.00 |
| PANEL E: | 1985:01-2012:12 | CARRY | MOM1 | VALUE | STOCKS | BONDS |
| | CARRY | 1.00 | -0.05 | 0.36*** | 0.31*** | -0.15*** |
| G10 | MOM1 | | 1.00 | -0.06 | -0.01 | 0.06 |
| Currencies | VALUE | | | 1.00 | 0.20*** | -0.07 |
| | STOCKS | | | | 1.00 | -0.04 |
| | BONDS | | | | | 1.00 |

**Table 8. Benchmarking Carry, Momentum and Value against Keynes 1920-27 and 1932-39**

The table compares the performance of Keynes' currency trading strategy (KEYNES) with the performance of CARRY, MOM1, MOM3 and VALUE strategies (with bid-ask spreads) over the periods during which Keynes traded, January 1920 to March 1939 (Panel A), January 1920 to May 1927 (Panel B) and October 1932 to March 1939 (Panel C). Keynes did not trade during the period June 1927 to September 1932. % Months Up and % Months Down show the proportion of months in each period when a strategy records a positive and negative return respectively. Source: authors' computations (see text).

| | CARRY | MOM1 | MOM3 | VALUE | KEYNES | STOCKS | BONDS |
|---|---|---|---|---|---|---|---|
| PANEL A: 1920:01-1927:05; 1932:10-1939:03 | | | | | | | |
| Mean annualized return (%) | 8.66 | 12.91 | 9.32 | -16.38 | 5.39 | 6.40 | 1.84 |
| Annualized St.Dev. (%) | 20.35 | 22.60 | 22.08 | 23.07 | 33.66 | 11.85 | 7.66 |
| Skewness | 0.05 | 0.31 | 0.08 | 0.60 | -7.98 | -0.19 | 0.09 |
| Kurtosis | 5.99 | 4.07 | 3.37 | 8.13 | 91.41 | 1.23 | 2.38 |
| Sharpe Ratio | 0.43 | 0.57 | 0.42 | -0.71 | 0.16 | 0.54 | 0.24 |
| % Months Up | 62.9 | 53.3 | 51.5 | 35.9 | 46.7 | 59.3 | 50.3 |
| % Months Down | 37.1 | 46.7 | 48.5 | 64.1 | 36.5 | 40.7 | 49.7 |
| Max Monthly Gain (%) | 22.40 | 26.70 | 23.58 | 33.30 | 31.54 | 11.98 | 7.25 |
| Max Monthly Loss (%) | -27.40 | -23.40 | -22.57 | -28.03 | -107.03 | -10.62 | -9.13 |
| PANEL B: 1920:01-1927:05 | | | | | | | |
| Mean annualized return (%) | 22.05 | 19.04 | 16.36 | -26.76 | 7.95 | 6.18 | 1.79 |
| Annualized St.Dev. (%) | 24.49 | 28.45 | 29.28 | 27.94 | 44.18 | 12.97 | 7.06 |
| Skewness | 0.39 | -0.20 | -0.11 | 0.07 | -6.95 | -0.22 | 0.90 |
| Kurtosis | 1.67 | 1.21 | 0.88 | 2.79 | 58.97 | 1.48 | 1.43 |
| Sharpe Ratio | 0.90 | 0.67 | 0.56 | -0.96 | 0.18 | 0.48 | 0.25 |
| % Months Up | 66.3 | 58.4 | 59.6 | 36.0 | 49.4 | 60.7 | 46.1 |
| % Months Down | 33.7 | 41.6 | 40.4 | 64.0 | 19.1 | 39.3 | 53.9 |
| Max Monthly Gain (%) | 22.40 | 26.55 | 23.58 | 29.40 | 16.15 | 11.98 | 7.18 |
| Max Monthly Loss (%) | -19.01 | -23.40 | -22.57 | -28.03 | -107.03 | -10.18 | -3.79 |
| PANEL C: 1932:10-1939:03 | | | | | | | |
| Mean annualized return (%) | -6.62 | 5.91 | 1.30 | -4.54 | 2.46 | 6.66 | 1.89 |
| Annualized St.Dev. (%) | 13.03 | 12.98 | 7.79 | 15.27 | 14.53 | 10.50 | 8.35 |
| Skewness | -5.19 | 4.14 | -1.11 | 5.64 | 5.56 | -0.09 | -0.48 |
| Kurtosis | 34.68 | 32.44 | 10.17 | 45.40 | 41.43 | 0.16 | 2.89 |
| Sharpe Ratio | -0.51 | 0.46 | 0.17 | -0.30 | 0.17 | 0.63 | 0.23 |
| % Months Up | 59.0 | 47.4 | 42.3 | 35.9 | 43.6 | 57.7 | 55.1 |
| % Months Down | 41.0 | 52.6 | 57.7 | 64.1 | 56.4 | 42.3 | 44.9 |
| Max Monthly Gain (%) | 5.97 | 26.70 | 7.01 | 33.30 | 31.54 | 7.45 | 7.25 |
| Max Monthly Loss (%) | -27.40 | -11.69 | -11.76 | -11.29 | -7.85 | -8.27 | -9.13 |

**Table 9. Common risk factors and excess returns to carry momentum and value 1920-39**

The table presents the results of OLS regressions of CARRY, MOM1 and VALUE monthly returns (without bid-ask spreads) on conventional macro-risk factors over 1920:02-1939:07. BUSINESS is the growth in *The Economist* Index of UK Business Activity. EMPLOYMENT is the growth in UK Employment. INFLATION is the UK CPI inflation rate. TED is TED spread, defined as the difference between the 3-month UK prime bill discount rate and the 3-month Treasury bill rate. TERM is the term spread defined as the difference between the UK Consol bond yield and the 3-month Treasury bill rate. UK STOCKS is the return the DMS Index. FXVOL is a proxy for foreign exchange volatility innovations measured as innovations to the average monthly volatility of the spot currency returns for all currencies in the sample. Heterodskedasticity-adjusted t-statistics are in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% levels respectively.

| | CARRY | | | MOM1 | | | VALUE | | |
|---|---|---|---|---|---|---|---|---|---|
| | α | β | $R^2$ | α | β | $R^2$ | α | β | $R^2$ |
| BUSINESS | 0.008** | 0.092** | 0.02 | 0.010*** | 0.018 | 0.00 | -0.007* | 0.019 | 0.00 |
| | (2.40) | (2.00) | | (2.63) | (0.30) | | (-1.85) | (0.34) | |
| EMPLOYMENT | 0.008** | 0.368** | 0.01 | 0.010*** | -0.184 | 0.00 | -0.007* | 0.122 | 0.00 |
| | (2.40) | (2.03) | | (2.69) | (-0.87) | | (-1.82) | (0.55) | |
| INFLATION | 0.009** | 0.177 | 0.00 | 0.010*** | 0.446 | 0.01 | -0.007* | -0.094 | 0.00 |
| | (2.56) | (0.40) | | (2.92) | (1.12) | | (-1.75) | (-0.19) | |
| TED | 0.008* | 0.014 | 0.00 | 0.010*** | -0.006 | 0.00 | -0.005 | -0.035 | 0.01 |
| | (1.89) | (0.39) | | (2.60) | (-0.20) | | (-1.02) | (-0.74) | |
| TERM | 0.015** | -0.005 | 0.01 | 0.012** | -0.002 | 0.00 | -0.009 | 0.002 | 0.00 |
| | (2.31) | (-1.58) | | (2.04) | (-0.64) | | (-1.30) | (0.59) | |
| UK STOCKS | 0.009** | -0.084 | 0.00 | 0.010*** | -0.067 | 0.00 | -0.007* | 0.092 | 0.00 |
| | (2.51) | (-0.90) | | (2.66) | (-0.63) | | (-1.82) | (0.83) | |
| FXVOL | 0.008** | -3.491* | 0.03 | 0.010*** | 0.629 | 0.00 | -0.007* | -0.680 | 0.00 |
| | (2.52) | (-1.78) | | (2.64) | (0.23) | | (-1.79) | (-0.31) | |

## Figure 1. Spot Exchange Rates against Sterling Pound 1900-2013

The figure plots monthly spot exchange rates of the Swiss Franc (CHF) and the US Dollar (USD) against the sterling pound from 1900 to 2013.
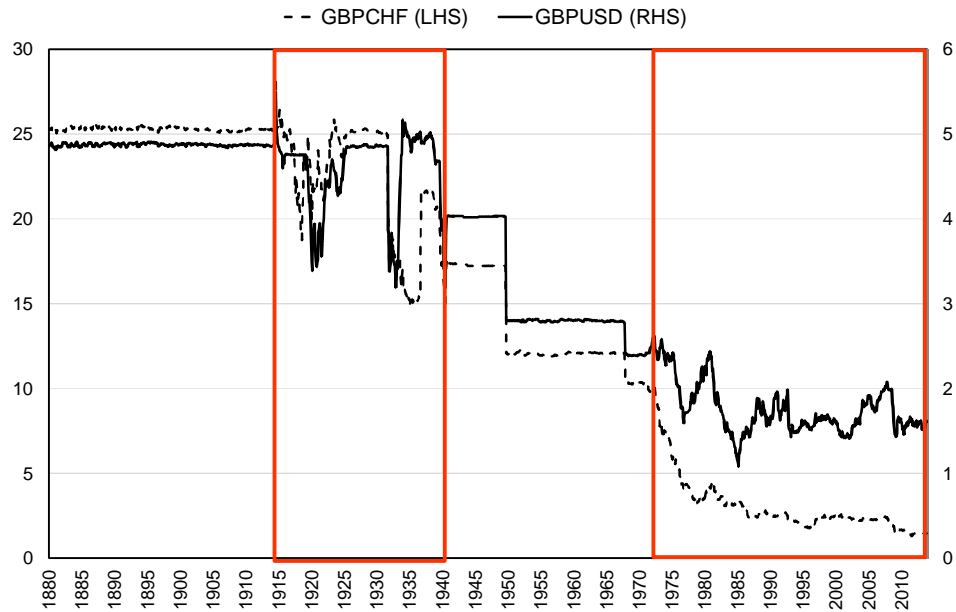


## Figure 2. Number of Tradable Currencies

The solid line shows the number of currencies in the sample from December 1919 to July 1939. The dotted line shows the number of currencies in the sample on the gold standard during this period. The shaded grey area shows the number of currencies excluded from the sample due to capital controls. Source: see text.
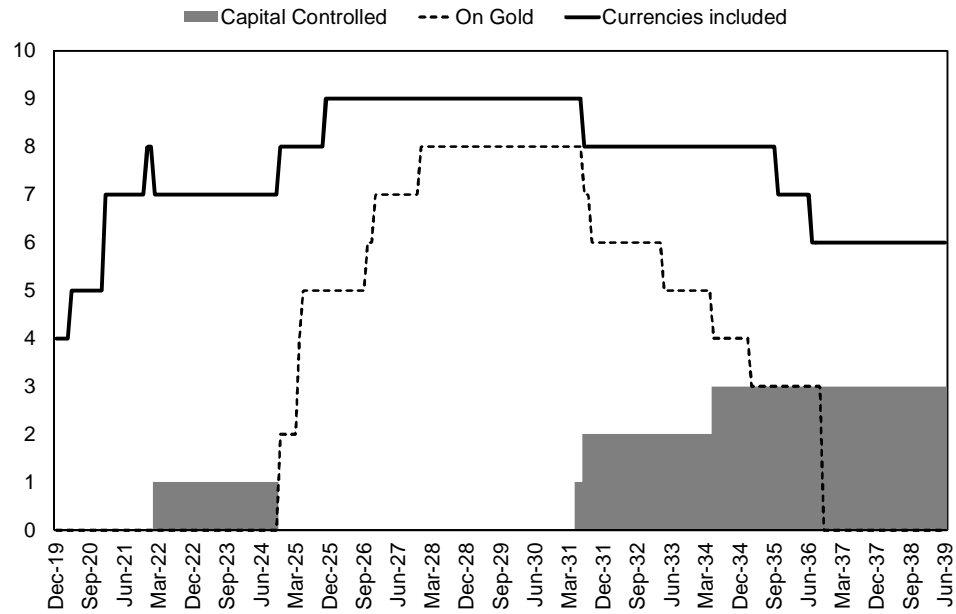
## Figure 3. Bid-Ask Spreads

The graph shows monthly average of spot and forward bid-ask spreads (in basis points) across all currencies in the sample, January 1920 to July 1939. Forward bid-ask spreads are available as of May 1922. Prior to that month, we estimate forward spreads in any given month by adding the mean difference between the forward and spot bid-ask spreads from May 1922 to December 1927 to the spot bid-ask spread at the month-end. Source: authors' computations (see text).
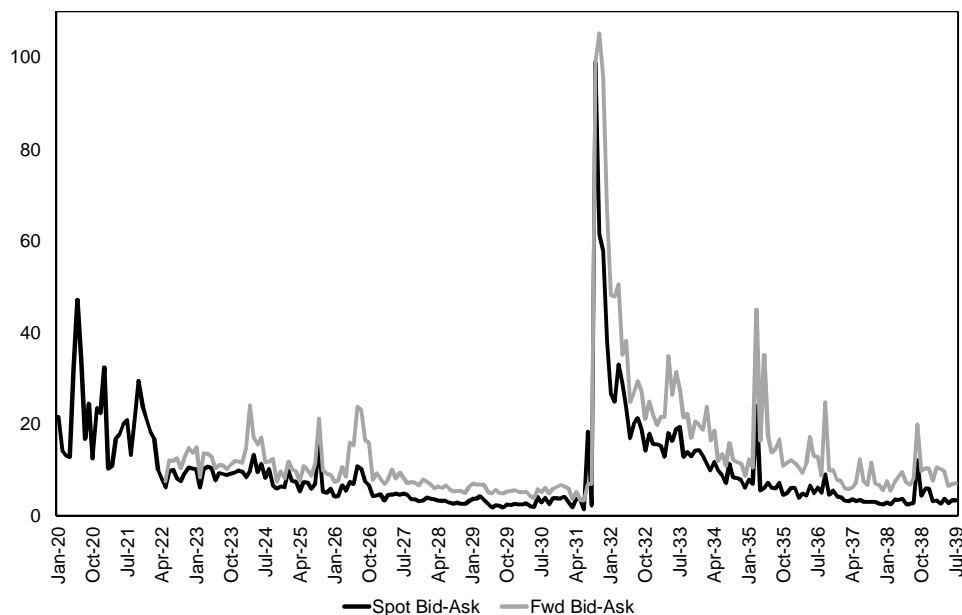


## Figure 4. Cumulative Excess Returns to Carry and Momentum

The graph shows the cumulative log excess returns (%) on the DMS UK equity index and on the CARRY and MOM1 strategies before transaction costs from end December 1919 until July 1939. Source: authors' computations (see text).
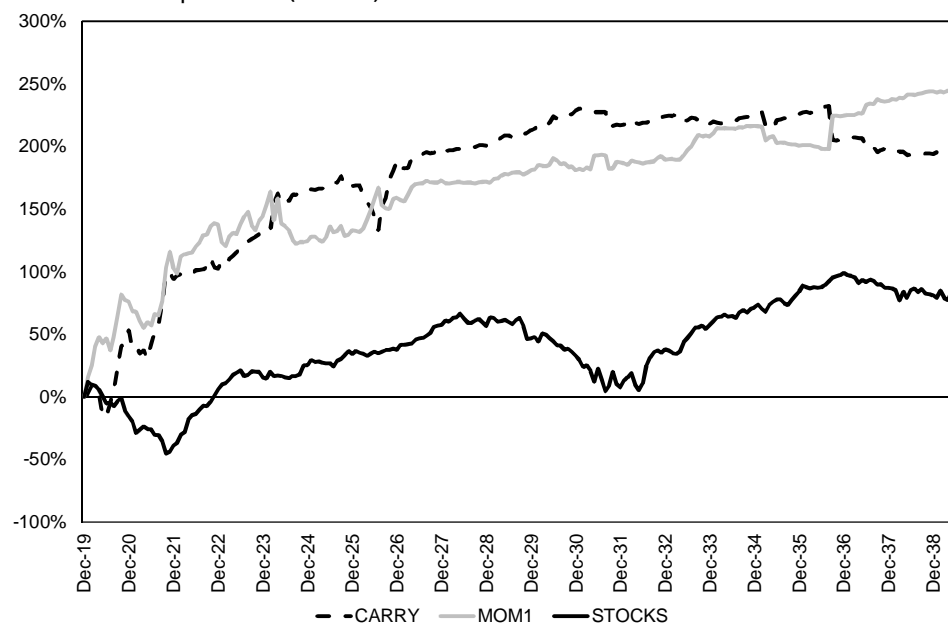
**Figure 5. Keynes' Overall Currency Trading Position in Sterling £, 1919-39**

The graph displays Keynes' monthly overall trading positions in sterling pounds estimated by marking-to-market each month all his currency positions using end-of-month forward exchange rates. Source: authors' computations (see text).
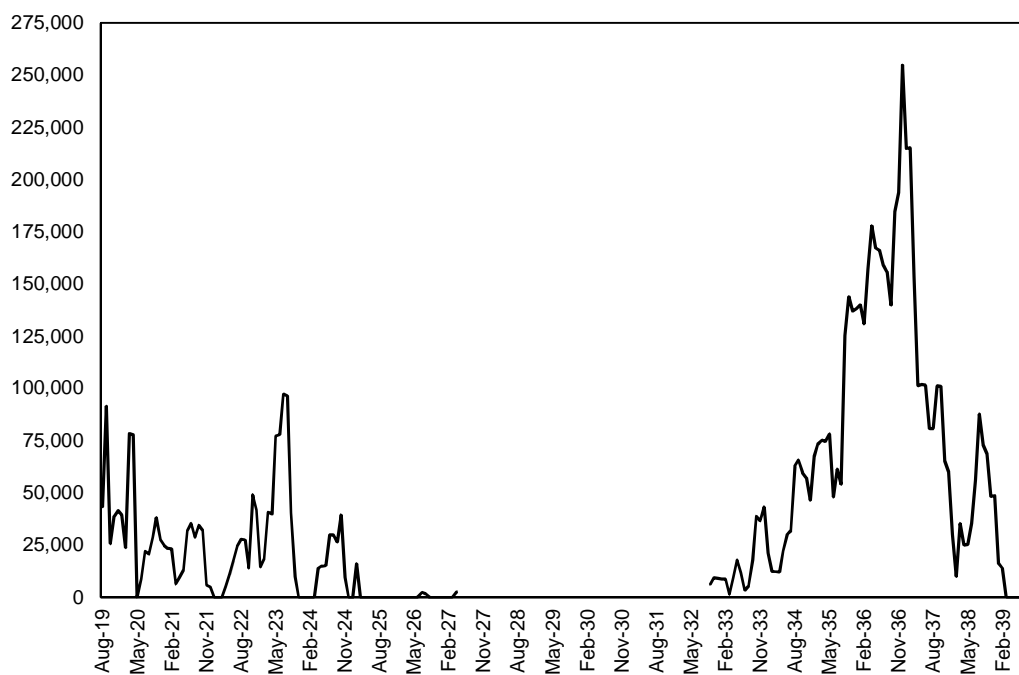
## Figure 6. Keynes' Long and Short Portfolios in £, 1919-39

The bars describe the long (+) and short (-) positions, marked-to-market in sterling pounds, of all currencies traded by Keynes between August 1919 to May 1927 and October 1932 to March 1939. The GBP position is equivalent to his net long or short position in all other currencies. Sources: authors' computations (see text).

### (i) Aug 1919 - May 1927



USD · FRF · DEM · ITL · GBP
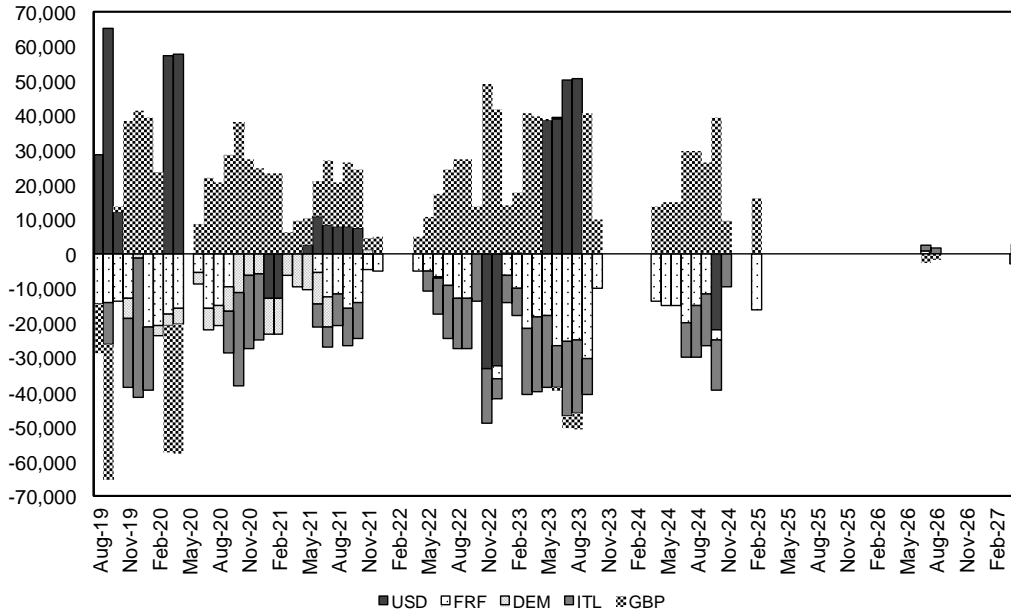
### (ii) Oct 1932 – Mar 1939



USD · FRF · NLG · GBP

43
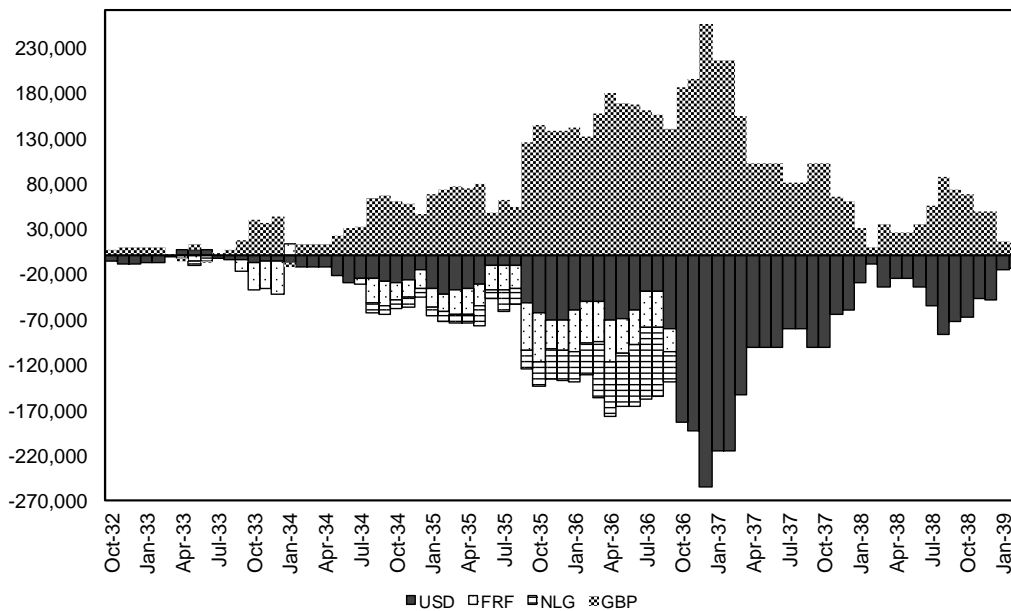
# Figure 7. Keynes' Trading Positions by Currency

## (i) USD 1919-27
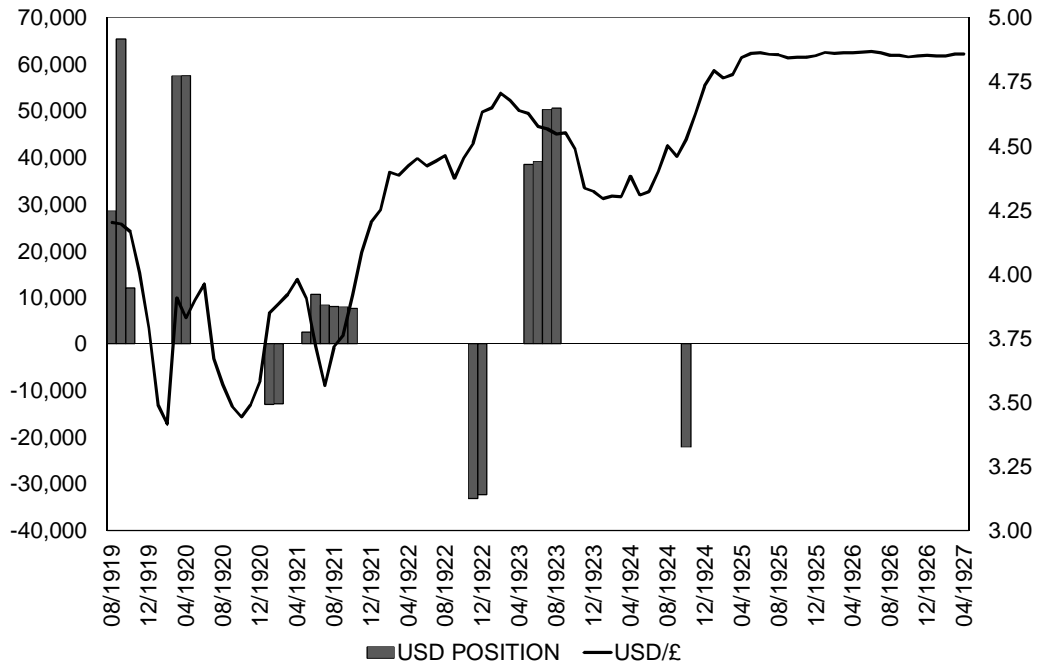


## (ii) FRF 1919-27
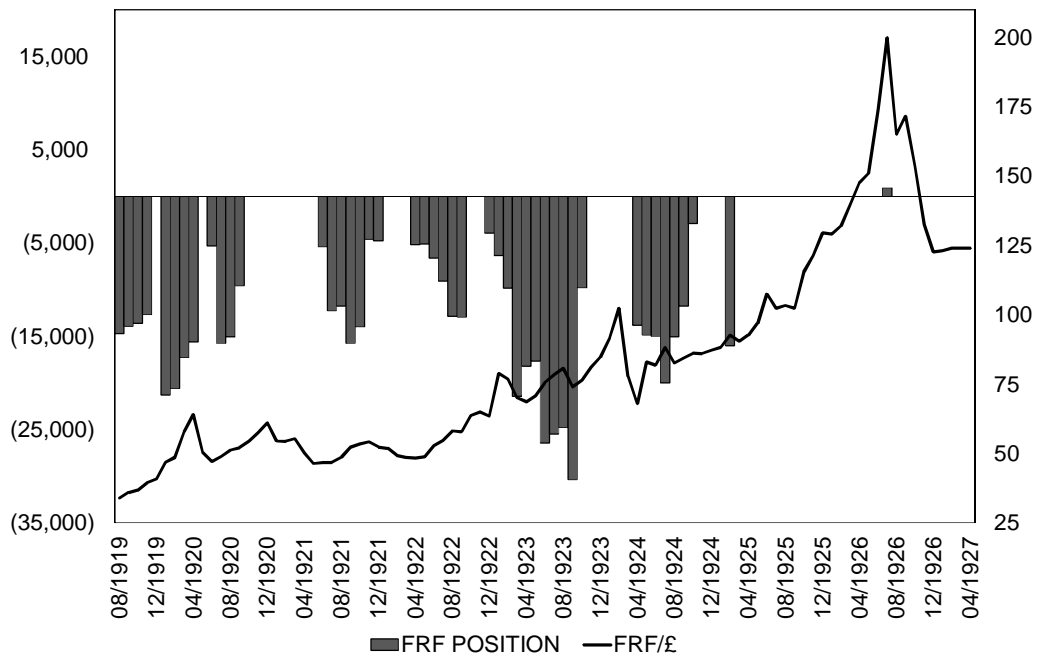
**Figure 7 (cont.)**

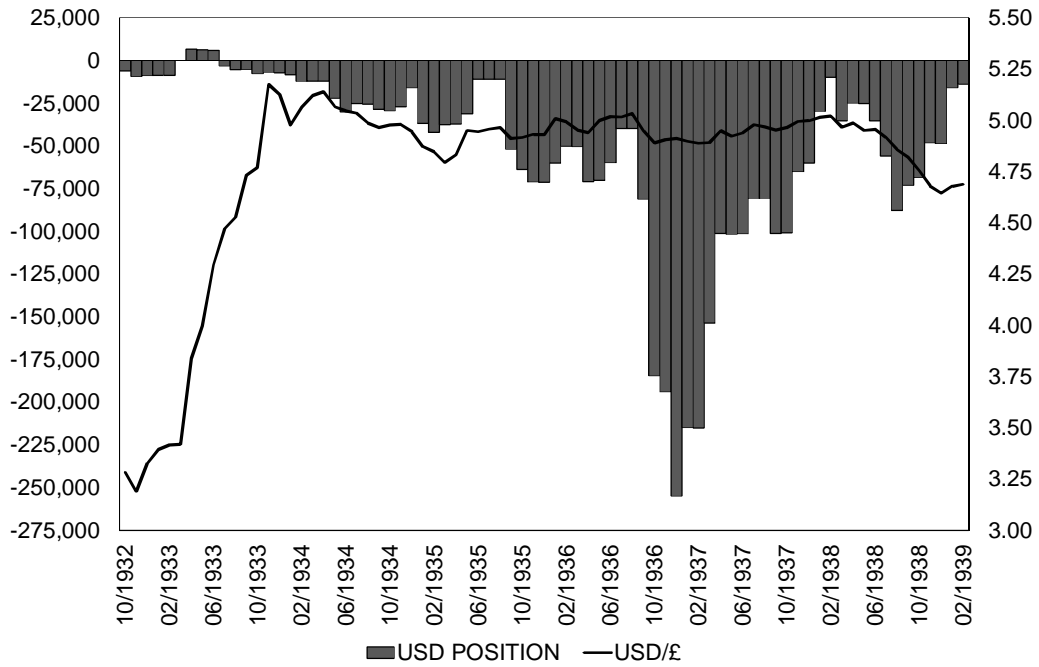**(iii) DEM 1919-1923 (log scale)**
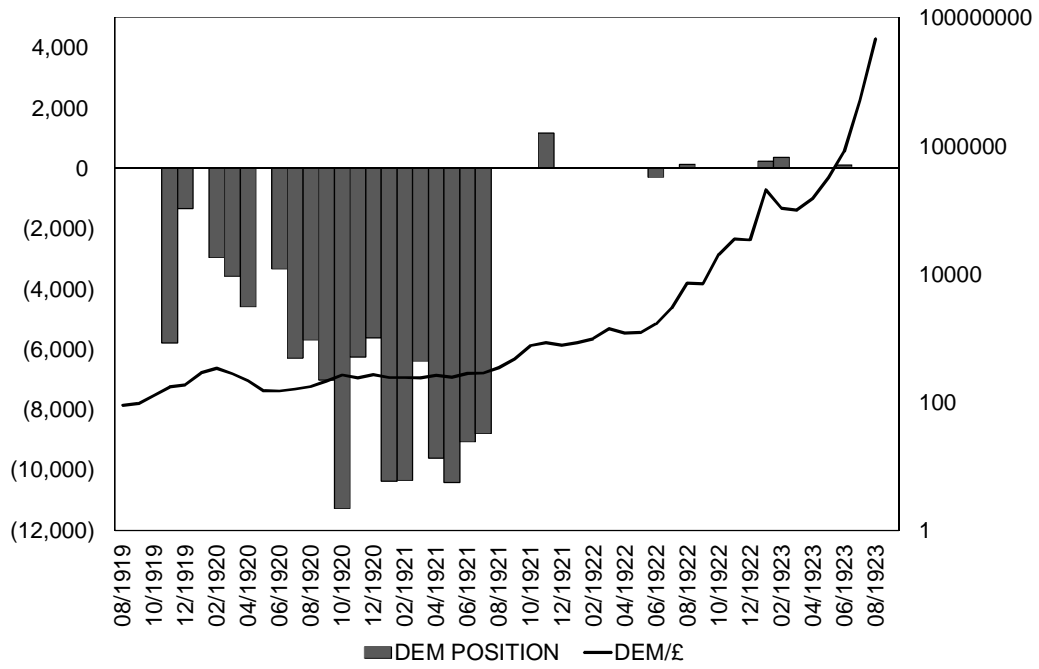


**(iv) ITL 1919-27**
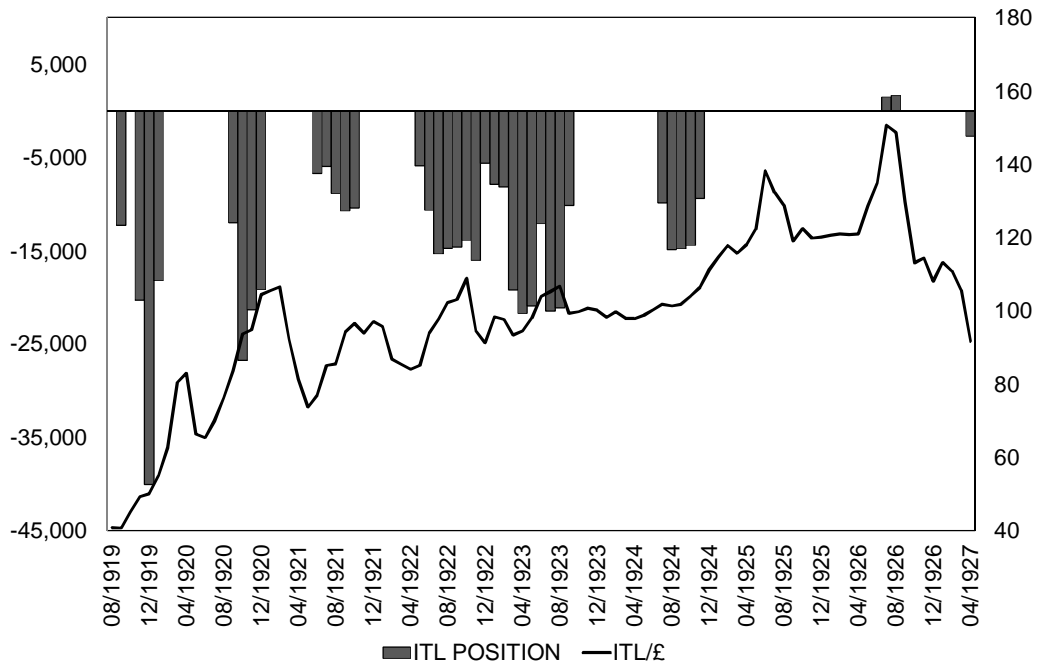
**Figure 7 (cont.)**

**(v) USD 1932-39**



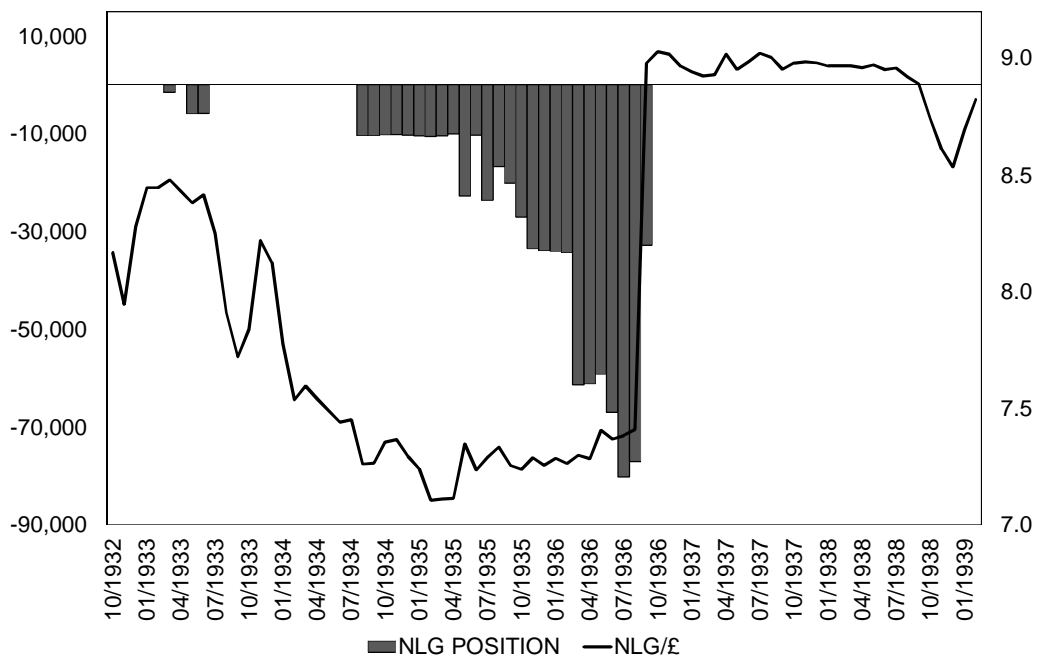**(vi) NLG 1932-39**

**Figure 7 (cont.)**
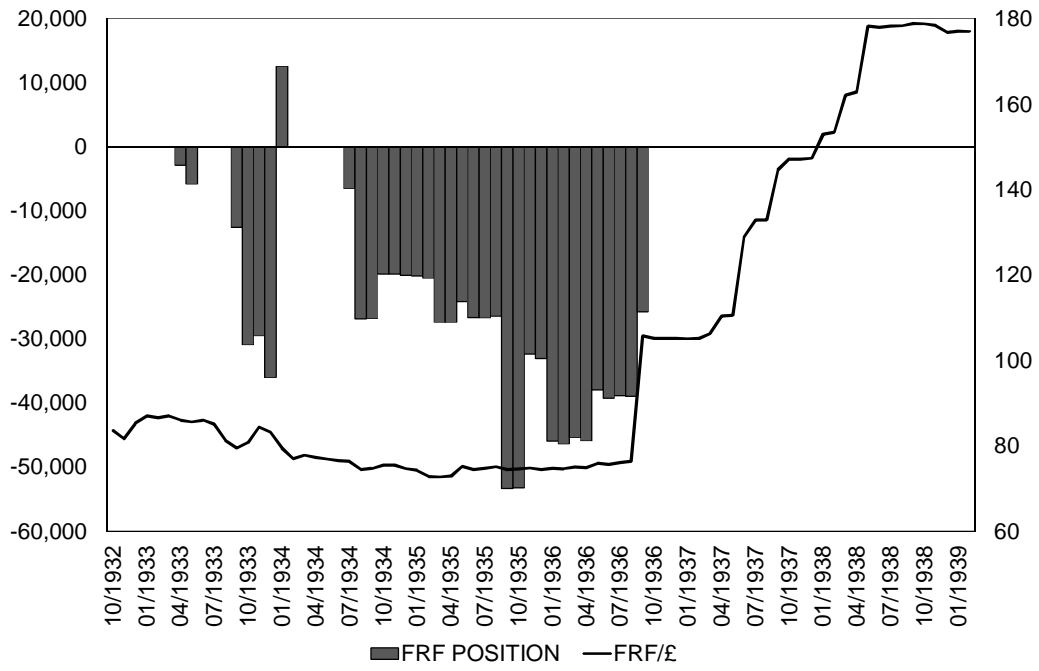
**(vii) FRF 1932-39**



FRF POSITION ▬ FRF/£ ——

**Figure 8. Keynes' Cumulative Gains (Losses) in £, 1919 to 1939**

The graph displays Keynes' cumulative gains (losses) in sterling pounds from August 1919 to May 1927 and again from October 1932 to March 1939. Source: authors' computations (see text).
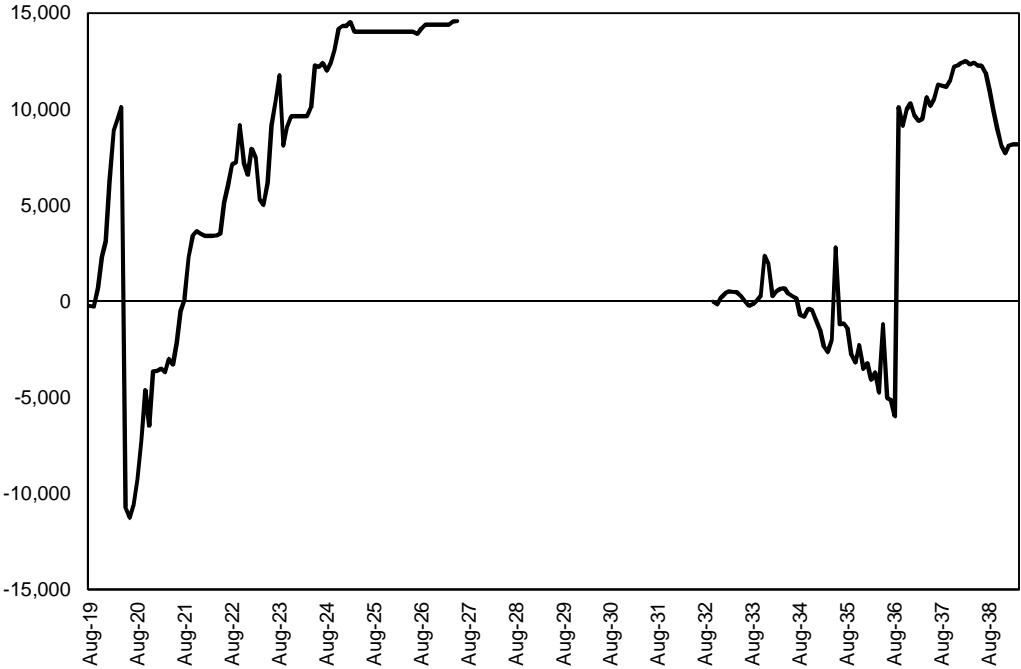
## Figure 9. Rolling Average Returns for Carry and Momentum Strategies

The figure displays the average monthly excess return over rolling windows of 36 months for the carry strategy (CARRY) and momentum strategy (MOM1). Source: see text.