Covered Interest Parity For Short Term Assets In Belgium

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This paper studies the covered interest parity between eurodeposits in Belgian francs and in the principal European currencies over the 1983-1989 period for various maturities. For this, we specify and test profit conditions which take into account the Belgian exchange rate system and transaction costs. Two investment strategies are possible: arbitraging from BF into foreign currency or from foreign currency into BF. We show that the CIP never holds simultaneously for both strategies except for the ECU. The frequency, the size of profitable arbitrage opportunities and the number of currencies allowing for profit opportunities depend on the maturity length. Contrary to most of the preceding papers, the EuroBF market is shown to be efficient and Belgium to have a highly mobile capital market.

1. The Covered Interest Parity

In the first part, we will focus on the covered interest rate parity (CIP). Before specifying the particularities of our paper, we will briefly remember the CIP. The CIP states that if international capital markets are integrated, the foreign exchange rate premium or discount on the domestic currency is equal to the differential between foreign and domestic interest rates. It can be written as:

\[ (1+i) = \frac{F}{S} (1+i^*) \]

where \( F \) is the forward exchange rate with a contract maturity of \( n \) months (number of units of domestic currency per unit of foreign currency),

* L'annexe comprend neuf tableaux disponibles auprès de l'auteur.
S is the spot exchange rate, 
i and i* are respectively domestic and foreign interest rates on 
identical securities (except the currency of denomination) matur-
ing in n months.

If (1) does not hold, then there will be a riskless profit opportunity 
available to arbitragers by borrowing one of the currencies, selling it spot 
for the other currency which is then lent, and buying back the original 
currency in the forward market. Such arbitrage will ensure that (1) holds 
by altering exchange and interest rates. Persistent profitable deviations of 
the covered interest differential may therefore indicate market inefficiency. Notice that this formula abstracts from any transactions costs.

However a number of theoretical explanations, which are listed below, 
can be offered to departures from CIP and these explanations do not 
question the efficiency of the market:
- Transactions costs (BRANSON 1969, FRENKEL and LEVICH 1975, 1977)
- Political risk (ALIBER 1973)
- Capital market imperfections (OTANI and TIWARI 1981)
- Data imperfections (TAYLOR 1989)
- Less than infinite elasticities for foreign exchange and securities 
  (LEVICH 1985)

2. Why To Test The Covered Interest Parity ?

The covered interest parity theorem had been largely empirically 
tested. However all these empirical works were realised between a deposit 
in eurodollars and another eurocurrency ¹ and never between two euro-
currencies other than the eurodollar, except the paper of MAENNIG and 
TEASE (1987) which studies the relationship between returns on non-
dollar denominated Eurocurrencies deposits (euro£ and euroDM, euroFF, 
eurolira).

A wide area of research is open for testing CIP between non-dollars 
denominated eurocurrencies. These tests are worthwhile as a large part of

¹ This can be explained by the fact that investors prefer to deal with the dollar as interme-
diate currency.
the euromarket is now devoting to currencies different from eurodollars. Furthermore testing the CIP is also useful for different reasons which are also valid for other international parity conditions (uncovered interest parity, purchasing power parity,...).

1) Every theoretical model needs an empirical validation.

2) A lot of theoretical and empirical models in international economics rely on the assumption of one or several international parity conditions. The failure of empirical tests could be explained by a deficient underlying assumption.

3) Under specific conditions, different relationships are mutually dependent. If one of them is not rejected, some simplifications are made possible to test other conditions. For example, if the CIP holds, testing the UIP can be done by testing that the forward exchange rate is an unbiased predictor of the future spot rate.

4) If different conditions hold, they could be useful in the study and the forecasts of exchange rates fluctuations.

5) The empirical investigations of these conditions contribute to the study of exchange rate markets efficiency.

6) As far as CIP is concerned, the respect of the covered interest parity is the proper indicator of international capital mobility (FRANKEL 1989). Empirical investigations of CIP form part of an ongoing research program on the efficiency of the foreign exchange and international capital markets. FAMA (1970) has shown that efficient markets ensure an optimal allocation of resources.

7) CIP can be seen as linking the term structure of interest rate to the term structure of forward exchange premia.

3. What Is Different In This Paper?

First, the most common method to test the CIP is to regress the exchange rate premium on the interest differential, expecting a unit coefficient and a null intersection. FRENKEL and LEVICH (1975) notice that this procedure leads to incorrect conclusions when individual deviations are large but on average zero or when deviations are very small but on average non-zero. The degree of market inefficiency relies on the existence of individual riskless profit opportunities and not on average profit opportunities. Therefore the important point is to know whether or not there is some potential riskless profit opportunities on a particular market. This is the viewpoint we have chosen in this paper. Results (profits or losses) are
computed for each data point and not on average. A calculation of the frequency with which covered arbitrage does not produce a significant profit allow us to make a direct inference about market efficiency: the higher this frequency the greater the market efficiency.

Second, most of the papers use non synchronous time data, which undoubtedly biases the results. Our data are gathered at the same time.

Third, except the study by Reding, the few papers which test the CIP between eurodollars and euroBelgian franc (or between eurodollars and a currency of a country with a two-tier exchange rate system), leads to a rejection of the CIP. For Belgium, one explanation could be the use of the official exchange rate in the tests, which does not correspond to the reality. We apply the legislation relative to residents and therefore use the financial market for the purchase and sale of the security and choose the most advantageous market (financial or official) for capital returns 2.

Fourth, transactions costs are usually neglected. We take into consideration the part of the transactions costs which depends on the bid-ask spread. Therefore we only neglect the brokerage fees. However these are much lower than costs involved by the bid-ask spread (TAYLOR 1989).

Fifth, as we mentioned above, most of the papers analyse the relationship between eurodollar deposit and another eurocurrency deposit. Here we study the CIP between on one hand, the euro Belgian franc and on the other hand, the principal European currencies and the eurodollar. The calculations are also made for several maturities which go from one month to one year.

Following these indications, we derive a no-profit condition which is very close to the formula used by the traders. This is the aim of section 4.

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2 Until March 1990, Belgium had a two-tier exchange rate system. A fixed exchange rate was maintained for current account transactions and a floating rate for capital financial transactions. Concerning the proceeds of investments (capital returns), the investor could choose either the official or the financial markets. Since May 1983, authorized banks were allowed to sell on the official market foreign currencies bought on the financial market (Minguet, chap. 4, section VI). However, as mentioned further, this paper does not take into consideration the bank investor but the non-bank investor.
4. The CIP Within a Two-Tier Exchange Rate System

Notations:

\( S^b \) and \( S^a \) are respectively the bid and ask spot exchange rates.

\( F^b \) and \( F^a \) are respectively the bid and ask forward exchange rates.

When there is a two-tier exchange rate system, financial and official rates must be distinguished:

\( S^f^b \) and \( S^f^a \) are respectively the bid and ask spot exchange rates on the financial market.

\( S^o^b \) and \( S^o^a \) are respectively the bid and ask spot exchange rates on the official market.

\( F^f^b \) and \( F^f^a \) are respectively the bid and ask forward exchange rates with a maturity of \( D \) days on the financial market.

\( F^o^b \) and \( F^o^a \) are respectively the bid and ask forward exchange rates with a maturity of \( D \) days on the official market.

\( i^*_b \) and \( i^*_a \) are respectively the (annualized) bid and ask interest exchange rate on the foreign deposit (maturity of \( D \) days).

\( i^{BF}_b \) and \( i^{BF}_a \) are respectively the (annualized) bid and ask interest rate on the domestic deposit (maturity of \( D \) days).

Two different strategies are possible:

- (a) - Borrow Belgian francs and invest them into foreign currencies.

- (b) - Borrow foreign currencies and invest them into Belgian francs.

Strategy -(a)- is unprofitable if the following condition is fulfilled:

\[
1 + (i^{BF}_a \times (D/365)) \geq (F^b/S^a) \times (1 + (i^*_b \times (D/360)))
\]
where $D$ is the number of days equal to the maturity $^3$.

Because of the two-tier exchange rate system, this formula has to be modified $^4$: the non-bank investors have the choice to convert the return on their investment on both markets.

i) If $FF < F0$ (appreciation of the financial market $^5$), then it is more profitable to convert the proceeds of investments on the official market. Therefore, condition (2) becomes:

$$(2a) \quad \{1 + [i^{BF}_a*(D/365)]\} \geq (1/SF^a) \ast \{FF^b + i^*_b \ast (D/360) \ast F0^b\}$$

$$\geq (FF^b/SF^a) \ast \{1 + i^*_b \ast (D/360) \ast h^b\}$$

where $h^b = F0^b/FF^b$

ii) If $FF > F0$ (depreciation of the financial market), using the financial market for all operations is more advantageous and the no-profit condition to use is the following:

$$(2b) \quad \{1 + [i^{BF}_a*(D/365)]\} \geq (FF^b/SF^a) \ast \{1 + (i^*_b \ast (D/360))\}$$

Strategy -(b)- is unprofitable if the following condition holds:

$$(3) \quad \{1 + (i^*_a \ast (D/360))\} \geq (S^b/F^a) \ast \{1 + (i^{BF}_b \ast (D/365))\}$$

Again, this formula has to be adapted to the Belgian exchange rate system:

i) If $FF < F0$ it is better to use the financial market for all operations and the no-profit condition is:

$$(3a) \quad \{1 + [i^*_a*(D/360)]\} \geq (SF^b/FF^a) \ast \{1 + [i^{BF}_b \ast (D/365)]\}$$

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$^3$ In the case of the United Kingdom and Belgium, we use 365 instead of 360 since this is the annual basis used for money market rates in pounds and Belgian francs.

$^4$ See footnote 2.

$^5$ On the period we study (March 1983-August 1989, see further), this situation is quite unusual. Since from May 1983, the official policy of the Central Bank of Belgium is the following: in order to fight the capital outflows, the official rate will be kept inferior to the financial rate.
ii) If FF > F0, then it is profitable to use the official market to convert the returns. Therefore, condition (3) has to be modified in this way:

\[(3b) \quad (1 + [i^*_a (D/360)]) \geq SF^b \ast \{(1/FF^a) + [iBF^b \ast (D/365) \ast (1/F0^a)]\} \geq (SF^b/FF^a) \ast \{1 + [iBF^b \ast (D/365) \ast (1/h^a)]\} \]

where \(h^a = (F0^a/FF^a)\)

Profits (in percent) resulting from such operations can be written as in Table 1.

**TABLE 1**

1) If FF < F0,

\[
BF\text{Return} = 100 \ast \{(FA^b/SA^a) \ast (1 + i^*_b \ast (D/360) \ast h^b)) - [1 + iBF^a \ast (D/365)]\}
\]

\[
FC\text{Return}^6 = 100 \ast \{(SF^b/FF^a) \ast (1 + iBF^b \ast (D/365)) \ast - [1 + i^*_a \ast (D/360)]\}
\]

2) If FF > F0,

\[
BF\text{Return} = 100 \ast \{(FA^b/SA^a) \ast (1 + i^*_b \ast (D/360)) - [1 + iBF^a \ast (D/365)]\}
\]

\[
FC\text{Return} = 100 \ast \{(SF^b/FF^a) \ast (1 + (iBF^b \ast (D/365) \ast (1/h^a))) - [1 + i^*_a \ast (D/360)]\}
\]

where BFReturn refers to strategy - (a) - and FCReturn to strategy - (b) -. 

To save space, we do not give the profit conditions to use when \(h^b < 1, h^a > 1\) and \(h^b > 1, h^a < 1\). They are easily derivable from what it is said above.

The two profit conditions give the percentage return either from borrowing Belgian francs and investing them into foreign currencies (arbitrage from BF to foreign currencies), or from borrowing foreign curren-

\[^6\] FC return means Foreign Currency return.
cies, converting them and investing the proceeds into Belgian francs (arbi-
trage from foreign currencies into BF).

5. Results

Relations of table 1 were calculated, on one hand, for deposits in euro
Belgian francs and on the other hand, for eurodeposits denominated in
Danish, French, German, Irish, Italian, Dutch, English and American cur-
currencies. As we use eurodeposit rates, we consider large amount
investments. If arbitrage opportunities do ever exist, bank investors could
realize higher profits since they can deal with swap rates. We also
examined the CIP for eurodeposits in ECUs. The maturities that we
analysed are one, three, six and twelve months. We prefer eurodeposits to
national deposits for the usual reason: eurocurrency deposits are
comparable in terms of issuer, credit risk, maturity and all other respects
except currency of denomination. The study covers the period from
January 1983 to August 1989. Monthly data are used and came from
Data Resources Inc.

Tables 2 and 3 give the number of profitable opportunities from arbi-
traging between Belgian francs and the other currencies. Table 2 refers to
strategy - (a) - and table 3 to strategy - (b) -.

1) First, we examine the results from arbitraging from BF to another
currency (Table 2). The analyze of the table leads to the following
conclusions:
   - The number of profitable operations is very limited: six currencies
     show profitable opportunities and there are maximum five profit-
     table operations for a same currency. If we take all operations into
     account, we get 21 profitable operations out of 2261, which is rather
     few.
   - The longer the maturity the higher the number of profitable oppor-
     tunities.

7 On the 1983-1989 period, the financial rate is higher than the official rate except in:
June 1985 and December 1987 for maturities of one, three and six months, and in April
 twelve months maturity.
8 Exchange and Eurodeposit rates are end-of-month data. All of them have been observed
 on the London market at the closing. Bilateral exchange rates were derived from
 bilateral dollar exchange rates.
2) If we compare both tables:

- Both strategies show around the same number of profit opportunities.
- Four currencies have offered covered arbitrage opportunities. And particularly, the Danish krona and the French franc, which display a higher frequency of profit.
- The maturity has still a positive effect on the frequency of profit opportunities.
A more precise analyze of the results leads to the following comments 9. First, the longer the maturity the higher the size of the profits. Second, in most of the cases, if arbitraging one of the currency for a short maturity shows profit opportunities at a given point in time, then profit opportunities will also be available at the same date for longer maturities. As we mentioned earlier, the 12-month maturity offers more riskless opportunities than each other maturity. Third, we can also derive the following indications:

Number of profit opportunities/year:

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It comes out that 1985, 1987 and 1988 have offered the most numerous profit opportunities. However, we should notice that for the period from January 1983 to September 1986, we did not have data for the Danish and Irish currencies and for the Ecu. For 1989, data were only available until August. The profit opportunities do not seem to be linked to turbulent periods (expected parity changes) in the EMS 10. 1988 did not witness any realignment. The profit arbitrage opportunities in 1987 arised between July and October and the realignment took place in January. Out of the 40 cases of profitable opportunities, only 8 coincide with EMS realignments: 3 for French francs, 1 for Deutsche marks, English pounds and US dollars (the last two currencies are not EMS currencies) in July 1985 and 2 for Irish pounds in June 1989. All the other currencies did not show any particular pattern during these periods. To be able to assess whether or not EMS realignments had a real impact, we should concentrate our study on these periods and use more frequent data as in Taylor (1989, CIP between English pounds and dollars). Taylor concludes that there is an apparent violation of the efficient market hypothesis with the degree of violation apparently a positive function both of the amount of turbulence and of the maturity considered. Taylor also noticed that the market appears to have increased in efficiency (fewer and smaller profit opportunities) over time. Our results do not show any particular decrease in the number of opportunities over time but do show a slight downward trend in profit.

9 Detailed result can be obtained on request.
size. As in Taylor, the frequency and the size of the profit arbitrage opportunities appear to be a positive function of the length of the maturity examined.

The Ecu market is the most efficient with zero arbitrage opportunity. The Euro-Italian lira market seems to be able to produce some very advantageous riskless profits (for example, the profit opportunities for the 12-month maturity is as high as 3.3 %). Only Italian, French and to a lesser degree Danish currencies presented real profit opportunities. For all the other market, the size of the profit is so small that we can conclude that these markets are efficient.

6. Conclusions

First, Ecu is the only currency which does not violate the CIP, whatever the strategy. We can also point out that only two currencies, the Italian lira and the Dutch guilder, present profit opportunities for both strategies. Second, the number of currencies for which profit opportunities do not exist decrease with the length of the maturity. Third, the frequency of profit arbitrage opportunities is a positive function of the length of the maturity. Fourth, contrary to most of the preceding papers relating to the Euro Belgian franc market efficiency, we can conclude that the Euro Belgian franc market is efficient in that few opportunities for risk-free arbitrage exist and therefore, that Euro Belgian capital market is highly mobile and integrated within international capital markets. Notice that arbitraging between Belgian francs and Danish kronas, French francs or Italian lira can lead to some advantageous profit opportunities and the efficiency of these markets is less strong. Fifth, as a consequence of the non violation of CIP, to test the uncovered interest parity between Belgian francs and other eurocurrencies, we only need to test that the forward rate is an unbiased predictor of the future spot rate.

References


