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RESEARCH NOTE RN-98-2

The Reaction of Exchange Rates and Interest Rates to News Releases

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Abstract

This note examines how the DEM/USD rate and US short-term and long-term interest rates respond to the release of payroll announcements. In contrast to a recent paper by Edison (1997), who employs a linear econometric model, we test the influence of news by comparing the absolute values of the percentage change between the means of symmetrically sampled values of daily exchange rate and interest rates before and after the announcement day to the distribution of absolute changes in means for all periods excluding non-farm payroll news. We find a highly significant reaction for both the DEM/USD rate and bond yields, depending on the window size. Short-term US interest rates, by contrast are hardly affected. Finally, the reaction of inflation-indexed bond yields to news announcements is investigated.

JEL classification codes: F31, F40

Key Words: exchange rates; interest rates; announcement effects; indexed bonds

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1. Introduction

In a recent publication Edison (1997) examined the response of exchange rates and interest rates – US and foreign – to economic news. His main findings may be summarized as follows: First, while US interest rates react to news on both real economic activity (non-farm payroll employment, unemployment, industrial production, and retail sales) and inflation (CPI and PPI), the response appears very small. Second, exchange rates do not react systematically to news on inflation. Third, exchange rates do react to news about real economic activity, with news on non-farm payroll employment having the relatively largest impact. Specifically, the US dollar was found to appreciate on average by 0.2% in response to a positive surprise of 100,000.

Clearly, there have been episodes where financial markets have reacted significantly more strongly than suggested by Edison's findings. In March 1998, for example, the consensus expected non-farm payroll employment to rise by about 250,000, whereas the released data showed a decline by 36,000. In response to this negative surprise of some 300,000, the US dollar eased by about 1.2 percent versus the deutsche mark in the three days following the announcement (Chart 1). At the same time, bond yields fell by around 10 bp, reflecting a downward adjustment of inflationary expectations and the perceived need for the Federal Reserve to raise the Fed funds target rate. Moreover, equity prices soared, with the Dow Jones breaking through the 9,000 mark.

2. Statistical Test Procedures

As the experience with the payroll announcement in March 1998 demonstrates, linear econometric specifications employed by Edison suffer from the problem, that the econometric results are subject to a high degree of uncertainty as to how much financial

markets actually react to the release of economic news. In light of this, we propose a different test procedure, focusing on the DEM/USD exchange rate and the US short-term and long-term interest rates with respect to their reaction to the release of non-farm payroll data – identified by Edison as the most important variable. In addition, the influence of the publication of non-farm payroll data, the Consumer Price Index (CPI), and the Producer Price Index (PPI) on 10-year US nominal and inflation-linked government bond yields is investigated.

More specifically, we test the influence of news publications by comparing the absolute values of the percentage change between the means of symmetrically sampled values of the levels of the daily exchange rate and interest rates before and after the announcement day to the distribution of absolute changes in means for all periods excluding non-farm payroll, CPI, or PPI publication dates.

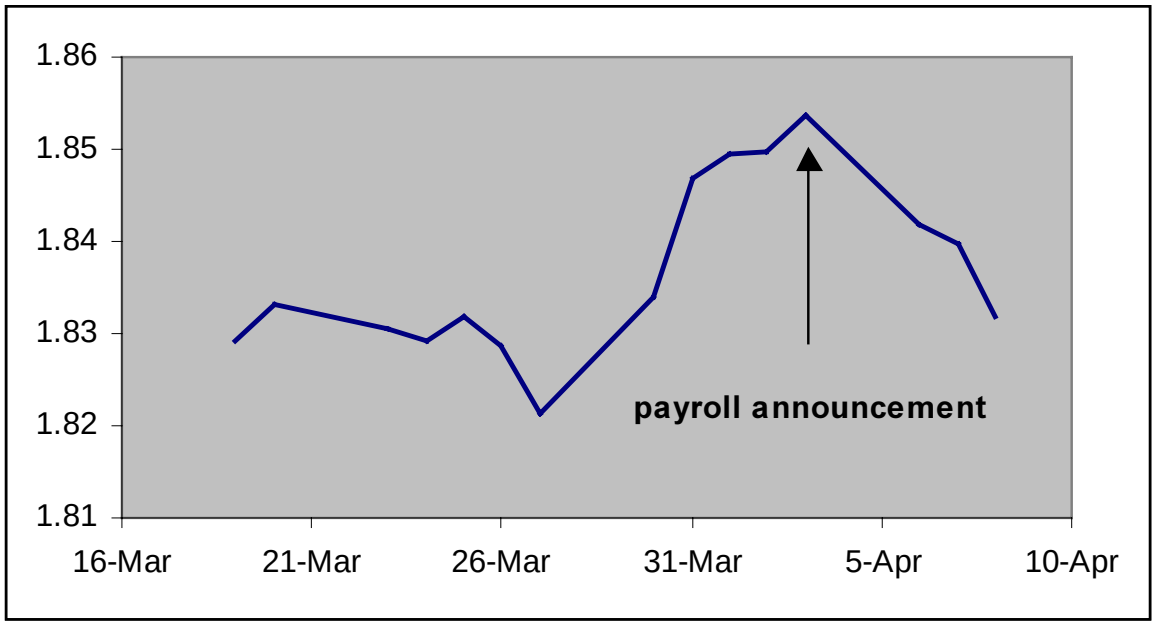

Chart 1: DEM/USD exchange rate around the March payroll publication.

The comparison of the distributions is based on two tests:

(1) Kolmogorov-Smirnov two-sample test statistic: $\max |S_1(x) - S_2(x)|$,

with $S_1(x)$, $S_2(x)$ being the cumulative sample distributions from the two populations, which is distributed according to the Kolmogorov-Smirnov distribution.

(2) the t-test for two independent samples, with the statistic:

$$t = \frac{\mu_1 - \mu_2}{\sqrt{\left[\frac{(n_1 - 1)\cdot \sigma_1^{\,2} + (n_2 - 1)\cdot \sigma_2^{\,2}}{n_1 + n_2 - 2}\right]\cdot\left[\frac{1}{n_1} + \frac{1}{n_2}\right]}}$$

whereby μ, σ and n denote the respective population‘s mean, standard deviation and sample size, following the Student’s t-distribution.

The major distinction between the two tests are their respective null hypotheses. The KS-test explores whether the two population distributions are significantly different, whereas the t-test compares the means of samples drawn from the two populations.

3. Empirical Results

As far as exchange rates are concerned, our analysis encompasses the period from January 1, 1979 to April 9, 1998, with 231 monthly payroll announcement dates. For 10-year US government bond yields, data restrictions limit the use of daily data to the period starting from 16/9/87, corresponding to 126 monthly payroll publications. Furthermore, we examine yields on 3-month US treasury bills starting from 6/2/89, corresponding to 109 payroll announcements. Finally, daily price data on 10-year US

nominal and inflation-indexed government bonds starting from 30/1/97 are used including a total of 45 monthly payroll, CPI and PPI publications. Announcement dates were obtained from the US Bureau of Labor Statistics. Daily exchange rates and interest rates were acquired from the WEFA data base.

3.1. DEM/USD Exchange Rate

The results indicate strongly that the DEM/USD was subject to significantly larger movements during the narrow window centered at the payroll announcements – all with known timing, but unknown outcome - than during any other time (Table 1). Depending on the sampling window the average jump correlated with non-farm payroll news is up to 29% larger than the moves commonly encountered. At an exchange rate level of DEM/USD 1.80, this translates into changes in the level of DEM/USD of nearly 1.2 pfennigs per Dollar on average. Note, however, that the significance of the announcement effect vanishes quickly with the increasing window size as new information counters any persistence of the announcement effects - generally within a week.

Sampling window	Average jump (payroll)	Average jump increase	Significance KS-test (p-value) [1]	Significance t-test (p-value)
1 day	0.65%	28.7%	1.1 E-7	2.7 E-3
2 days	0.76%	20.8%	6.5 E-4	2.3 E-2
3 days	0.87%	14.1%	1.3 E-2	1.2 E-1
4 days	0.96%	8.8%	8.3 E-2	3.2 E-1

Table 1: Average percentage change of FX levels around non-farm payroll announcements.

Furthermore, when we consider the volatility, measured as the standard deviation of the returns around the news release with the same methodology, the results show that following the event the average volatility increases significantly – depending on the sampling window of up to 27% (Table 2). This can be at least partially explained by the large volumes commonly traded in the wake of the announcement.

Sampling window	Average volatility (before publication)	Average volatility increase	Significance KS-test (p-value)	Significance t-test (p-value)
2 days	0.52%	27.0%	2.1 E-4	3.5 E-2
3 days	0.54%	21.3%	4.0 E-5	7.6 E-2
4 days	0.57%	11.2%	1.3 E-2	3.2 E-1
5 days	0.61%	4.0%	2.5 E-1	7.0 E-1

Table 2: Average volatility change of FX levels induced by non-farm payroll announcements.

3.2. US Short-term and Long-term Interest Rates

10-year bond yields were found to react strongly to payroll announcements, showing significantly larger movements during a narrow window centered at the payroll announcements than during any other time (Table 3). Depending on the sampling window the average jump correlated with non-farm payroll news is up to 65% larger than the moves commonly encountered. Note that the significance of the announcement effect vanishes with increasing window size as new information counters the persistence of the announcement effect, although it is interesting to realize that the effect is larger and markedly more persistent for bond yields than for the DEM/USD exchange rate.

[1] Marginal significance level p=0.01 is equivalent to 99% significance.

Sampling window	Average jump (payroll)	Average jump increase	Significance KS-test (p-value)	Significance t-test (p-value)
1 day	1.02%	65.1%	2.0 E-7	4.2 E-6
2 days	1.23%	54.7%	4.6 E-7	2.7 E-5
3 days	1.34%	38.9%	3.8 E-4	1.9 E-3
4 days	1.44%	29.4%	1.2 E-2	1.6 E-2
5 days	1.52%	22.6%	8.7 E-3	5.9 E-2
6 days	1.61%	18.7%	3.2 E-3	1.1 E-1

Table 3: Average percentage change of 10-year US bond yields around payroll announcements.

For both, the USD/DEM exchange rate and the 10-year US bond yields the observed increase in the average jump turns out to be even more significant by defining the level change using a weighted average of the data in the sampling window. However, for simplicity only the results of the simpler uniform weighting scheme are presented.

Assuming that payroll news induces a revision of activity/inflation forecasts and thus interest rate expectations relevant to all financial markets, one would expect that the average jumps (considering their size and direction) of the DEM/USD exchange rate and the 10-year bond yields around payroll announcements should reveal a sizeable correlation. However, a systematic study of the data shows a surprisingly small correlation (Chart 2), indicating that different interpretations to news releases are present in the FX and bond markets. A linear correlation coefficient of 32.2% for a sampling window of 1 day is found, which implies that only for that fraction of the time the implications of the payroll news lead to similar movements in both markets.

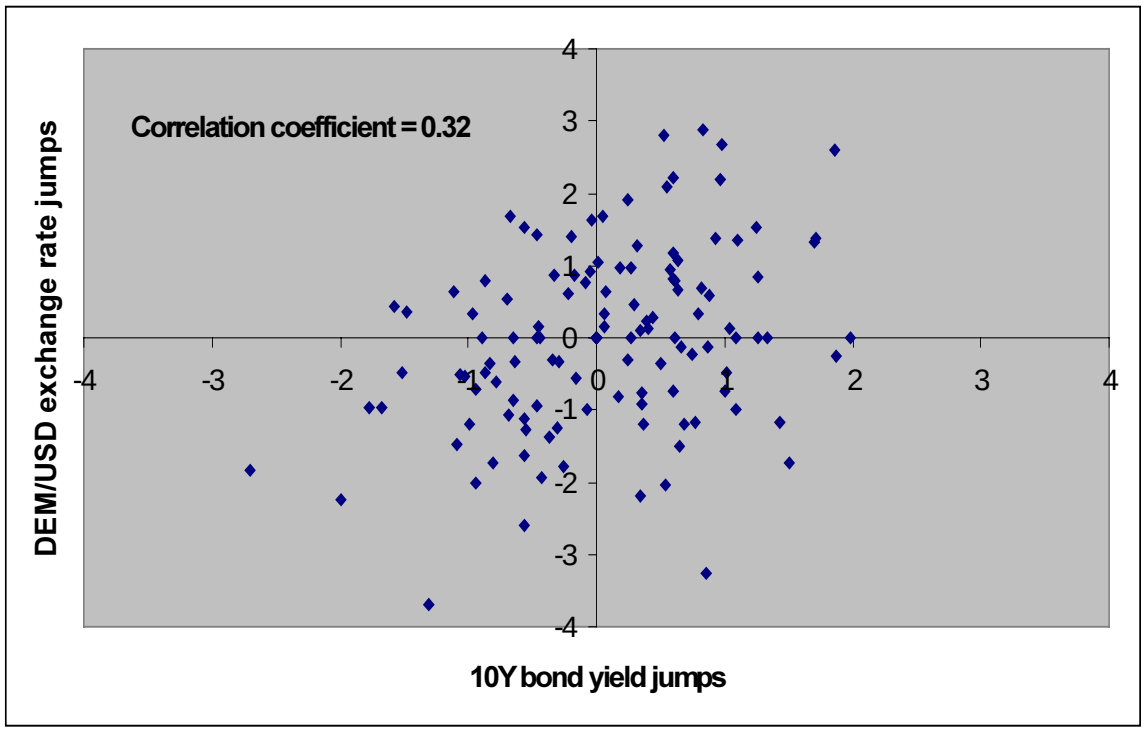

Chart 2: Correlation between the average jumps of the DEM/USD exchange rate and the 10-year bond yields around payroll news (1 day window).

Not surprisingly, in the case of 3-month treasury bill rates the average absolute jumps around the publication dates of payroll news turn out to be not significantly different from the level changes during any other period. As a matter of fact, covered interest rate parity (CIP) holds at any given point in time, including the window around payroll announcements. In view of the significant jumps of the average DEM/USD exchange rate around payroll announcements and the insignificant effects in the German and US interest rates, the compensating quantity is necessarily the forward exchange rate. This is corroborated by the forward rate time series, where strong level changes around the announcement dates of payroll news can be observed, just as for the previously studied FX spot rate (Table 4). For the single day sampling window, the linear correlation between spot and forward amounts to 99.4% (Chart 3). As similarly large correlations

are found in periods not affected by announcements we cannot find a systematic effect of payroll news for the CIP relation.

Sampling window	Average jump (payroll)	Average jump increase	Significance KS-test (p-value)	Significance t-test (p-value)
1 day	0.73%	41.1%	6.4 E-5	4.7 E-3
2 days	0.80%	30.3%	3.2 E-2	4.1 E-2
3 days	0.88%	18.2%	1.4 E-1	2.3 E-1
4 days	0.94%	8.5%	4.5 E-1	5.8 E-1

Table 4: Average percentage change of the 3-month DEM/USD forward rate around payroll announcements.

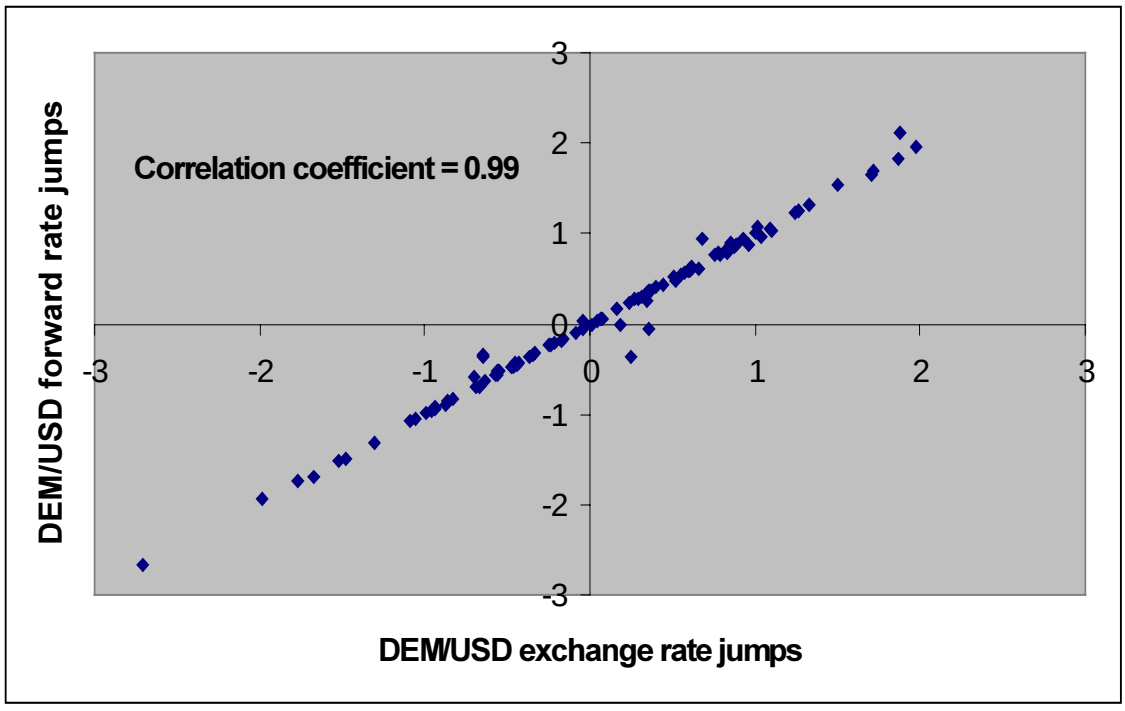

Chart 3: Correlation between the average jumps of the DEM/USD exchange rate and the 3M forward rate around payroll news (1 day window).

3.3. US Inflation-Indexed Bonds

Consumer price index linked bonds, a long time successful UK concept are increasingly popular fixed income instruments, issued since 1997 also by the US government. Their design reveals the real rate of interest in financial markets, rather than the nominal rate which is frequently subject to inflation surprises. But how does this supposed neutrality show up in the market? A recent study by Wilcox (1998) indicated that a main difference in the dynamics of index-linked debt versus nominal debt is the smaller announcement effect in response to various economic news. Theoretically this should be the case because the nominal debt is affected by news on real and monetary issues, whilst the indexed debt is designed to be independent of the latter. This appears to be basically in line with studies on the UK, where indexed bonds were already introduced in the 1980s (Barr and Campbell, 1997).

To discern between real interest rate effects and revisions to the inherent inflation expectation we investigate separately the effects of non-farm payroll announcements versus CPI and PPI news releases. The latter two should have no significant effect on inflation-linked bonds. Since payroll data contain not only an implied price component through inflationary influences of the labor market, but also comprise information about expected real economic growth, an influence to nominal as well as to inflation-indexed bonds is expected.

In Charts 4 - 6 we illustrate the influence of news announcements on the behavior of the bond prices in a 10 day window around the publication dates. Each graph shows the projection of the normalized bond price levels, which have been shifted to zero and multiplied by +1 or –1 depending on the direction of the level change.

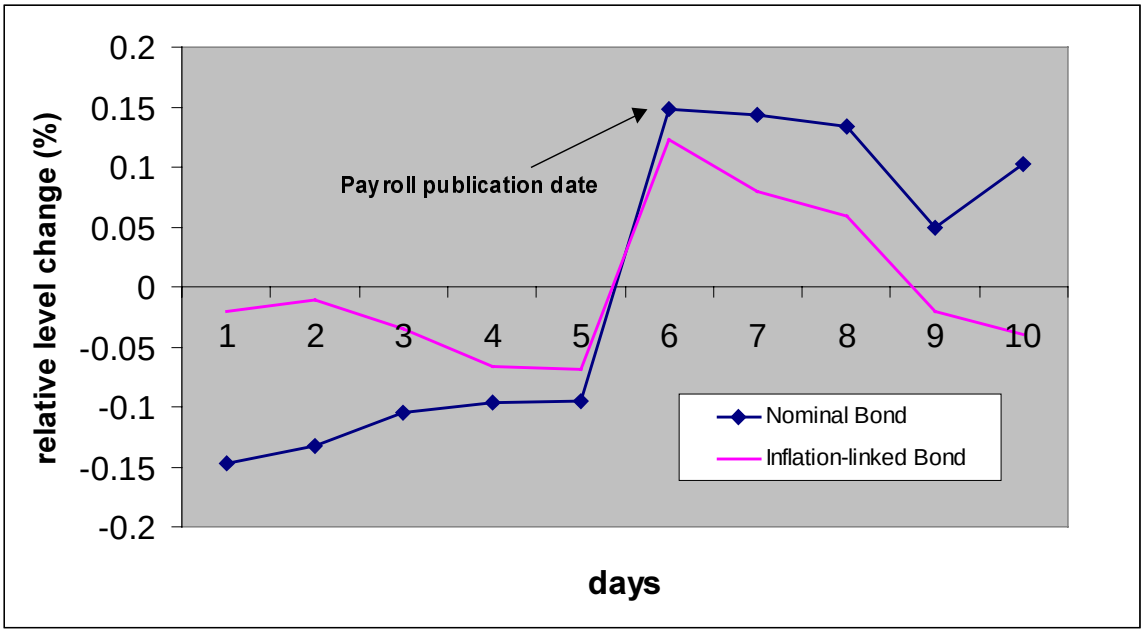

Chart 4: Influence of payroll publications to the relative price levels of 10-year US nominal and inflation-indexed government bonds.

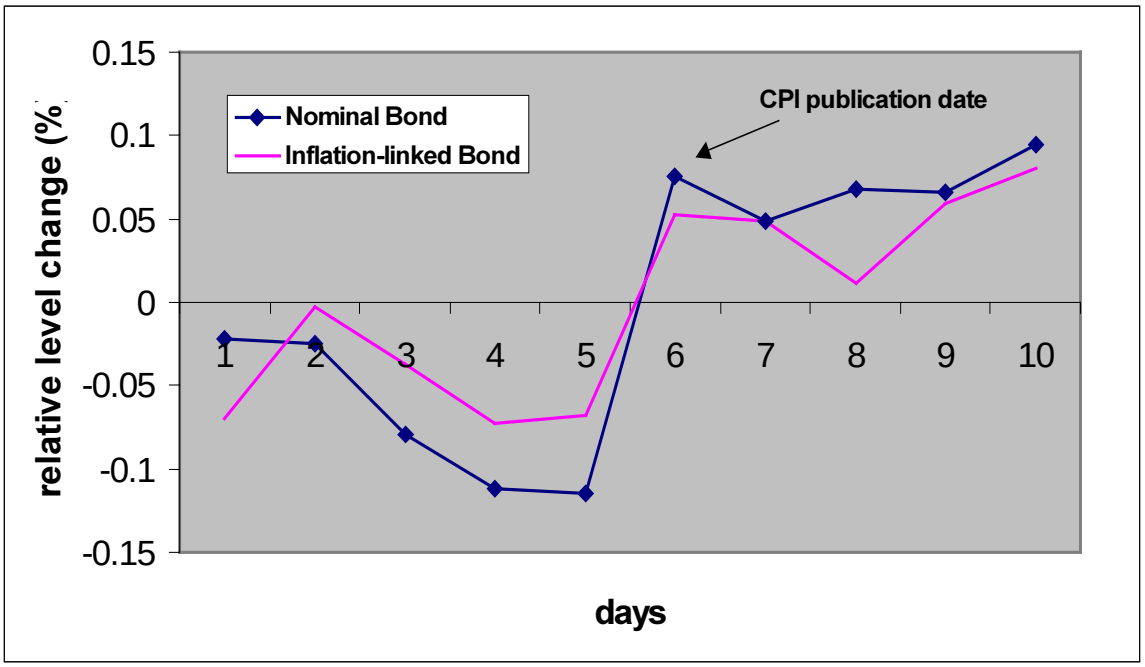

Chart 5: Influence of CPI publications to the relative price levels of 10-year US nominal and inflation-indexed government bonds.

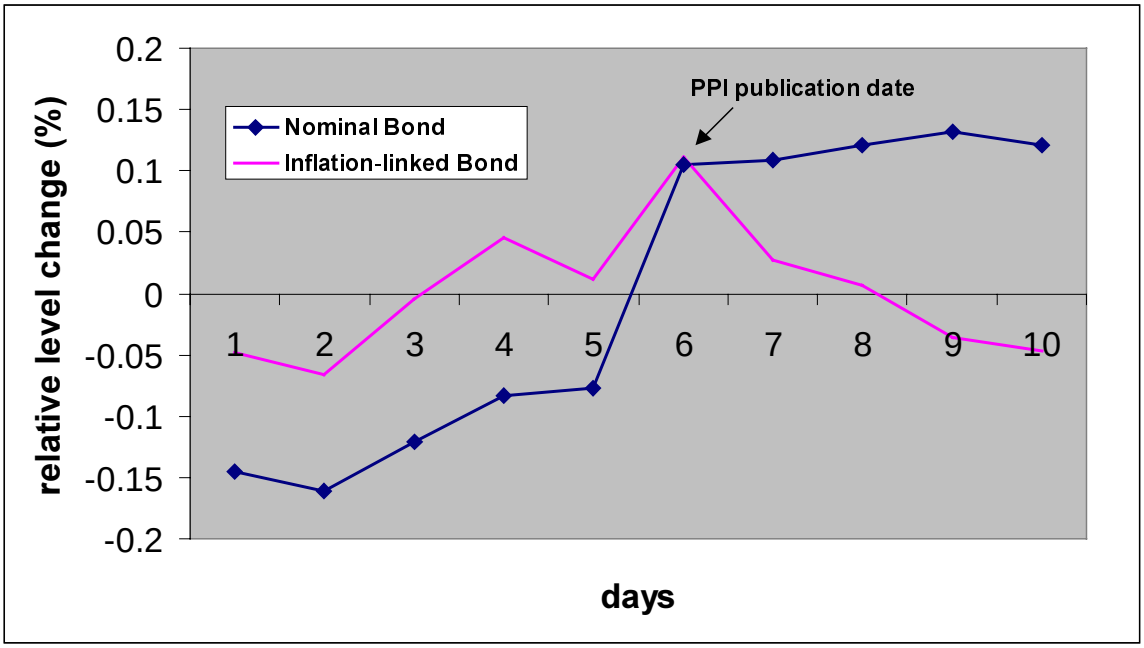

Chart 6: Influence of PPI publications to the relative price levels of 10-year US nominal and inflation-indexed government bonds.

The results (Table 5) indicate the following: payrolls, while only relevant for the growth expectation of indexed bonds has nearly the same influence on the latter as it has for nominal bonds during the same time period. The inflation neutrality of the indexed bonds is confirmed by comparing the announcement effect of PPI and CPI news on both types of bonds. There is - as expected - no significant effect on the former while nominal bonds react clearly to both types of announcements. In accordance with that the total volatility during the considered period for inflation-indexed bonds is found to be 17% smaller than for nominal bonds. In conclusion, from the study of the announcement effects of 45 news releases on non-farm payroll, CPI and PPI data we derive that although inflation-indexed bonds generally behave as expected, their reaction to economic news seems to be fairly sizeable in relation to the reaction of nominal bonds.

News Release	Average jump in price around news release		Average jump increase w.r.t. remaining time		Significance KS-test (p-value)	
	Nominal Bond	Indexed Bond	Nominal Bond	Indexed Bond	Nominal Bond	Indexed Bond
Non-farm Payroll	0.24%	0.19%	77.2%	68.9%	0.046	0.052
Consumer Price Index	0.19%	0.12%	38.2%	6.56%	0.286	Not sign.
Producer Price Index	0.18%	0.10%	33.3%	-12.09%	0.062	Not sign.

Table 5: Comparison of the average percentage changes between 10-year US nominal bonds and inflation-indexed bonds (1 day window).

4. Conclusion

Our study of the influence of a large sample of payroll announcements on the DEM/USD exchange rate and 10-year US government bond yields shows clear evidence that these asset prices were subject to larger movements (of up to 65%) around payroll news than during any other time. A surprisingly small correlation between 10-year bond yields and the DEM/USD exchange rate around the publication dates is observed, indicating that different interpretations to news releases are present in the FX and bond markets. In contrast to the DEM/USD exchange rate and the 10-year bond yields, 3-month US treasury bill rates do not exhibit behavior around payroll announcements which is significantly different from other periods. This result combined with the conservation of covered interest rate parity implies a large correlation between forward and spot rates around payroll announcements, which is also observed in the FX forward data. Hence, even though payroll news affect the spot rate much more than short-term interest rates, CIP is achieved exclusively by changes of the forward rate.

This may not be surprising, given that short-term interest rates are largely determined by central banks.

The analysis of 10-year US inflation-indexed bonds shows that their total volatility during the considered period is 17% smaller than the volatility for nominal bonds. The influence of payroll publications, while only relevant for the growth expectation of indexed bonds, has nearly the same influence on the latter as it has on nominal bonds. The inflation neutrality of the indexed bonds is confirmed by comparing the announcement effect of PPI and CPI news on both types of bonds. Although inflation-indexed bonds generally behave as expected, their reaction to economic news seems to be fairly sizeable in relation to the reaction of nominal bonds.

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