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Thomas Nitschka

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Have investors been looking for exposure to specific countries since the global financial crisis? - Insights from the Swiss franc bond market

Thomas Nitschka[1]
Swiss National Bank

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Abstract
Bonds of Swiss non-government borrowers offered higher daily excess returns (‘alphas’) than suggested by their sensitivities to standard risk factors over the sample period from 2007 to 2014. By contrast, comparable bonds (same currency denomination and credit rating category) issued by foreign entities did not offer significant risk-adjusted returns and exhibited markedly different sensitivities to Swiss and global risk factors. However, the positive risk-adjusted returns on Swiss bonds disappear when controlling for measures of uncertainty such as stock price volatility. Swiss bond prices rose when stock market volatility was high thus offering insurance in times of uncertainty.

JEL: G10, G12, G15

Keywords: bond return, risk factors, uncertainty

[1] Mailing address: Thomas Nitschka, Monetary Policy Analysis, Swiss National Bank, Börsenstrasse 15, P.O. Box, CH-8022 Zurich;
Phone: +41-(0)44-6313628; FAX : +41 (0)44 6313175 ; E-mail: thomas.nitschka@snb.ch
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1 Introduction

The experience from recent crisis episodes suggests that investors valued exposures to particular groups of countries (emerging markets)[2] or specific countries (e.g. Switzerland) by investing in assets that are tightly linked to these economies. In this regard, Switzerland is a particularly interesting case because of the Swiss franc's perceived status as "safe-haven" currency. A "safe-haven" asset provides insurance against systematic risks on average and in particular in times of crisis and uncertainty.[3] This characteristic is the usual reference to explain why the Swiss franc appreciates by more than suggested by macroeconomic fundamentals against many other currencies in times of international financial stress[4].

This paper gauges the plausibility of the hypothesis that investors searched for exposure to particular countries since the global financial crisis with an empirical analysis of the Swiss franc (CHF) bond market. It does so by assessing the determinants of daily excess returns on a variety of CHF bond indexes in times series regressions of bond excess returns on risk factor mimicking portfolio returns for the sample period from 3 January 2007 to 14 March 2014.

The bond indexes under study have three characteristics that potentially affect the pricing of these assets. However, two of these dimensions are the same for all bond indexes. First, the bond indexes are CHF denominated. Hence, the potential appeal of CHF denominated assets because of this currency's "safe-haven" status applies to all of the bond indexes under study. Second, all bond indexes distinguish between the same international credit rating categories and thus the credit and default risks of the bond issuers. These bond indexes, however, vary along one dimension: the country of origin of the issuer. The available data distinguishes between Swiss non-government, foreign government and foreign corporates as issuers of CHF denominated bonds in a given credit rating category. Hence, the empirical analysis allows to

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[2] Fratzscher et al. (2013), Mc Kinnon and Liu (2012)

[3] Habib and Stracca (2012) provide a list of macroeconomic characteristics that seem to determine a 'safe haven' economy. Switzerland exhibits many of these characteristics.

[4] Kugler and Weder (2005), Grisse and Nitschka (2013), Hoffmann and Suter (2010), Hossfeld and MacDonald (2014), Ranaldo and Söderlind (2010)

assess if excess returns on Swiss bonds have been priced differently than their foreign counterparts that exhibit the same characteristics, i.e. currency denomination as well as the issuer's credit and default risk. This evidence should shed light on the issue if investors particularly value assets from specific countries since the global financial crisis.

The empirical assessment uses the risk factor mimicking portfolios proposed by Fama and French (1993) as benchmark model to describe the excess returns on the different bond indexes in times series regressions. The time series regressions reveal that bonds of Swiss non-government borrowers exhibited positive risk-adjusted returns ('abnormal' returns or 'alphas') over the sample period, i.e. significant excess returns that are not captured by the exposure to the Fama and French (1993) risk factors. This finding does not pertain to their counterparts (same currency denomination and credit rating) issued by foreign corporates or foreign governments. Including Swiss and global bond market risk factors or additionally taking stock market risk factors into account leaves the evidence of positive risk-adjusted excess returns on Swiss bonds unaltered.

The conclusion from the empirical analysis is twofold. First, the evidence reflects that Swiss bonds were priced differently from their foreign counterparts since 2007 irrespective of the underlying credit and default risk as well as the currency denomination. Second, exposure to standard risk factors does not provide an adequate description of Swiss bond returns since the global financial crisis. As emphasized in Black et al. (1972), if the empirical model is an adequate description of the Swiss bond data, the estimate of the constant and hence the risk-adjusted excess returns should be zero because both the dependent and the explanatory variables are excess returns.

What risk factor is missing? Assessments of the 'safe haven' characteristic of Swiss franc exchange rates provide some guidance. Ranaldo and Söderlind (2010) use high frequency data to show that Swiss franc exchange rates tend to appreciate when uncertainty, as measured by stock market volatility levels, is high. This observation occurs irrespective of the source of uncertainty, e.g. in times of a natural catastrophe or a financial crisis. Exposure to the Swiss economy seems to be particularly attractive for investors when faced with high uncertainty. A similar mechanism could be at work in the CHF bond market as well. Indeed, visual inspection leaves the impression that the abnormal returns on the Swiss bonds abruptly turned positive at the end of 2008 and stayed positive thereafter albeit at lower levels. The period at the end of 2008 was characterized by particularly high uncertainty in the course of the global financial crisis and the collapse of Lehman Brothers.

To gauge the plausibility of this argument, I augment the risk factor regressions by including that component of an option-implied expected stock market volatility measure that is orthogonal to the Fama and French (1993) risk factors. It turns out that the abnormal returns on CHF bonds issued by Swiss entities disappear once controlling for the orthogonalised stock market volatility level. The regression coefficients of the Swiss bonds' excess returns on stock market volatility are positive and significant indicating that these bonds tend to gain value when uncertainty is high. By contrast, these regression coefficients are negative and insignificant for the excess returns on CHF bonds issued by foreign entities.

The remainder of the paper is organized as follows. Section 2 describes the data. The empirical methodology is introduced in section 3. Section 4 provides the details of the empirical analysis. Section 5 concludes.

2 Data and descriptive statistics

This section describes the data, its sources and provides descriptive statistics of the CHF asset returns under study as well as the excess returns on the risk factor mimicking portfolios of the Fama and French (1993) pricing model. The sample period runs from 3 January 2007 to 14 March 2014. The start of the sample period is restricted by the availability of the CHF bond index data that distinguishes between Swiss and foreign issuers of CHF bonds.

2.1 Dependent variables: Excess returns on CHF bond indexes

This study describes CHF denominated asset returns in an asset pricing framework. The asset returns under consideration comprise returns on nine different CHF bond indexes (total return indexes, i.e. indexes including coupon payments). The data is freely available on the website of the SIX exchange. To obtain excess returns, I subtract the Swiss National Bank's policy rate, the 3M CHF Libor rate, converted into daily[5] rates from returns on the bond and stock indexes. The source of the 3M CHF Libor is the Swiss National Bank (SNB).

The bond indexes can be classified into three categories. The first set of bond indexes consists of bonds of Swiss non-government issuers. This "non-government" category comprises Swiss corporates as well as cantons and municipalities but excludes Swiss sovereign bonds. Moreover, the SIX exchange provides indexes of CHF bonds issued by foreign corporates and of CHF bonds issued by foreign governments. Within each bond category – Swiss non-government, foreign corporate, foreign government – there are subindexes based on three different credit rating ranges: AAA to AA, AAA to A and AAA to BBB. These credit ratings are based on the assessments of the major international credit rating agencies. As the CHF secondary bond market is small compared with other bond markets, using credit rating ranges rather than the specific rating categories (AAA vs. AA vs. A, etc.) is necessary to ensure a sufficient number of bonds in the respective indexes.

Table 1 presents the descriptive statistics, i.e. mean, standard deviation and Sharpe ratio of the bond excess returns that are the dependent variables in the empirical analysis. Irrespective of the type of bond issuer, the excess returns increase with the broadening of the credit ratings range. On average, bonds in the range between AAA and BBB exhibit more credit risk than bonds in the narrower, higher issuer quality range between AAA and AA.

In addition, the bond index returns show that returns were highest on bonds issued by Swiss non-government entities. The lowest returns were offered by CHF bonds issued by foreign

[5] To calculate daily rates I assume that there are on average 250 trading days each year.

governments. This pattern could reflect two separate explanations. On the one hand, it could be the case that CHF bonds of Swiss issuers were perceived as having lower credit quality than CHF bonds issued by foreigners despite similar international credit ratings. Then they have to offer higher excess returns. On the other hand, the sample period covers several crisis episodes and still the excess returns are positive on average. Hence, these positive returns might reflect the insurance value of CHF bonds in general and the hedging value of CHF bonds issued by Swiss entities in particular. They gain in value as risks materialized in the various crises over the sample period. The empirical analysis of these returns' exposures to risk factors aims at shedding light on these issues.

[about here Table 1]

2.2 Explanatory variables: The Fama and French (1993) bond risk factors

The benchmark model to analyse excess returns on the CHF bond indexes described above is the risk factor model proposed by Fama and French (1993). Fama and French (1993) show that two risk factors, calculated from bond market data, are sufficient to explain average bond excess returns. The first bond market risk factor is the excess return on a government bond index. Here I use a total return index of Swiss government bonds to construct this factor, i.e. the return on this index in excess of the 3M CHF Libor rate. The second bond market factor measures the spread between long-term corporate and long-term government bonds. I approximate this factor in the Swiss case by the return difference between the 7-10 year maturity non-government index comprising both Swiss and foreign issuers of the whole rating range (AAA to BBB) and the corresponding Swiss government bond index. The source of the bond index data is the website of the SIX exchange.

While it is reasonable to assume that Swiss risk factors are well suited to explain the excess returns on Swiss CHF denominated bonds, this assumption is not necessarily justified for the CHF bonds issued by foreigners. Therefore, I assess if global versions of the two bond risk factors help to improve the regression fit in the subsequent asset pricing tests. The return on the Bank of America Merrill Lynch total return index of global government bonds in excess of the four-week USD T-bill rate, obtained from the Federal Reserve Board website, is my global proxy of the government bond excess return. The return difference between the Bank of America Merrill Lynch total return index of global corporate bonds and the global government bond index is then my measure of the global corporate bond spread. The two Bank of America Merrill Lynch indexes are obtained from Datastream.

Table 2 provides the mean excess returns (in % per day) and the standard deviations of the excess returns on the four risk factor mimicking bond portfolios in panel A. The world bond market risk factors are on average more volatile than their Swiss counterparts and their mean excess returns are also higher. Panel B of table 2 gives the pairwise correlations between the Swiss and world bond risk factor returns. Interestingly, the correlations are relatively low. The correlation between Swiss government bond excess returns and the excess returns on a global portfolio of government bonds is only 0.34 over the sample period. The Swiss and global corporate spreads are also only weakly correlated with a coefficient of 0.09. Hence, Swiss bond market risk factors do not really represent global risks. The empirical analysis conducted in this paper takes this observation into account by including all four bond market risk factors into the baseline regressions

[about here Table 2]

2.3 Additional explanatory variables

2.3.1 Stock market data

As additional controls, I use the stock market risk factors proposed by Fama and French (1993). The excess return on the market portfolio is the first stock risk factor in this model. I approximate this factor by the excess return on the MSCI total return index of Switzerland. The MSCI indexes also allow to construct proxies of the two other stock market risk factors: the return difference between small and big stocks (SMB) and the return difference between high book-to-market equity (value) and low book-to-market equity (growth) stocks (HML) which Fama and French (1993) advocate to take into account as sources of systematic risk that are not captured in the market return. The MSCI data is freely available on the MSCI website.

As in Nitschka (2010) I define the SMB return as

$$SMB_t = 1/2(r_t^{SV} + r_t^{SG}) - 1/2(r_t^{LV} + r_t^{LG}) \tag{1}$$

while the HML return is given by

$$HML_t = 1/2(r_t^{SV} + r_t^{LV}) - 1/2(r_t^{SG} + r_t^{LG}) \tag{2}$$

where SV abbreviates small, value stocks, i.e. stocks with low market capitalization and high ratio of book equity to market equity. SB denotes stocks with low market capitalization and low ratio of book equity and market equity. Their counterparts for stocks with high market capitalization, large stocks, are abbreviated by LV and LG respectively.

Table 3 presents the mean and standard deviation of these returns (panel A) and their pairwise correlations with each other and with the Swiss bond risk factors in panel B. The market return and SMB return were slightly positive over the sample period. By contrast, the return on the HML portfolio turned negative. Since there is evidence linking returns on the HML portfolio to economic prospects not captured by the market return (Liew and Vassalou, 2000) and economic distress (Kapadia, 2011), the observation of negative returns on HML is natural given the crisis periods during the sample period.

The pairwise correlations presented in panel B of table 3 show that overall the correlations between the different factors are relatively low. Exceptions are the negative correlations of the market return with the return on SMB and the excess return on the Swiss government bond index with correlations between -0.4 to -0.5. In addition, the correlation between the return on SMB and the return on HML is close to -0.5. In any case the different risk factors seem to capture different dimensions of systematic risk.

[about here Table 3]

2.3.2 Proxy of uncertainty: Option implied stock market volatility

Assessments of the safe-haven status of Swiss franc exchange rates highlight that the Swiss franc tends to appreciate against most other currencies in times of high or rising uncertainty as approximated by option-implied stock market volatility indexes (Grisse and Nitschka, 2013; Ranaldo and Söderlind, 2010). Against this backdrop it could be the case that sensitivity to stock market volatility plays a role in determining Swiss and foreign issuers' CHF bond returns as well. Therefore, I employ the option-implied expected stock market volatility index of the Swiss Market Index compiled by SIX exchange (VSMI) and in robustness checks its US counterpart (VIX) as proxy of global uncertainty (Rey, 2013). The two volatility series are obtained from the SIX exchange and the CBOE website respectively.

Figure (1) plots the two volatility indexes over the sample period. Clearly there is a strong positive correlation (correlation coefficient: 0.95) over the sample period. The two volatility series reached their highest levels around the collapse of Lehman Brothers at the end of 2008 and its aftermath in early 2009. During the euro area sovereign debt crisis period in 2010 and 2011, volatility reached elevated levels as well.

[**about here Figure 1**]

3 Methodological background

The basic pricing equation for excess returns is the starting point for the subsequent empirical analysis. It says that expected excess returns on any asset *i*, $r_t^{i,e}$, discounted by the stochastic discount factor, m_t, should be zero

$$0 = E_t(r_{t+1}^{i,e} m_{t+1}) \tag{3}$$

Assuming linearity of the discount factor and normalizing the constant term in the linear specification to unity, i.e. $m_{t+1} = 1 - f_{t+1}^{'} b$, taking unconditional expectations and rearranging gives

$$E(r_t^{i,e}) = \mathrm{cov}(r_t^{i,e} f_t \ )b \tag{4}$$

in which f_t is a *k x 1* vector of risk factors and *b* denotes the respective vector of factor loadings.

In the context of the present paper it is useful to work with the beta representation of equation (4):

$$E(r_t^{i,e}) = \text{cov}(r_t^{i,e} f_t)\Sigma_f^{-1}\Sigma_f b \tag{5}$$

where Σ_f is the variance/covariance matrix of the risk factors and the following definitions $\text{cov}(r_t^{i,e} f_t)\Sigma_f^{-1} = \beta^i$ and $\Sigma_f b = \lambda$ apply, such that equation (5) can be written in more compact notation as

$$E(r_t^{i,e}) = \beta^i \lambda \tag{6}$$

which says that expected excess returns on asset *i* are a function of asset *i*'s sensitivity (β^i) to the risk factors and the risk prices of these factors (λ) which are the same for all assets (Cochrane, 2005).

The empirical part of this paper uses excess returns on bond indexes as test assets. In addition, it employs varieties of the Fama and French (1993) pricing model. In this model the risk factors (*f*) are approximated by excess returns on risk factor mimicking portfolios such as a broad stock market portfolio or a government bond portfolio. Hence, the beta representation, equation (6), can be applied to the risk factor proxies as well. Suppose we have a risk factor A that is empirically approximated by the excess return on an asset portfolio mimicking this factor. Then the regression coefficient in a regression of the excess return on factor A, $r_t^{A,e}$, on itself is unity, such that $E(r_t^{A,e}) = \lambda^A$.

Against this backdrop, the pricing equation (6) is easily translated into a time series regression because the risk prices should be approximately equal to the unconditional average excess returns on the risk factor mimicking portfolios. The regression then takes the following form

$$r_t^{i,e} = a^i + \beta_A^i r_t^{e,A} + \beta_B^i r_t^{e,B} + \ldots + \varepsilon_t^i, t = 1,\ldots T \tag{7}$$

where A and B denote different risk factors and superscript e an excess return.

As all factors are approximated by returns that are either in excess of a short-term debt rate or returns on zero net investment strategies, the estimates of the constant (a) in the regression (7) should be zero if the empirical model adequately describes the dependent excess returns (Black et al. ,1972). This is a direct implication of the pricing equation (6). Hence, if the estimate of the constant is different from zero, then there are "abnormal" returns, i.e. returns that are unrelated to the employed risk factor proxies. The abnormal or "risk-adjusted" return on asset i equals $a^i + \varepsilon_t^i$. On average (i.e. in expectations), the error term ε_t^i is zero but including it in the definition of an abnormal return allows to analyse its dynamics over the sample period.

4 Empirical results

This section presents the main empirical results from time series regressions of the form as shown in equation (7). The regression results highlight differences in risk factor exposures, measures of regression fit and risk-adjusted, i.e. abnormal, excess returns between CHF bonds issued by Swiss or foreign entities within the same credit rating category.

4.1 Baseline results

The left-hand variable in the time series regressions is the log return on bond index i in excess of the 3M CHF Libor rate on day t. In the baseline specification of equation (7), these returns are regressed on a constant (a) and the bond market risk factors proposed by Fama and French (1993). The bond market risk factors are approximated by the return on a Swiss government bond index in excess of the 3M CHF Libor (gov_t) and the return differences between long-term non-government and Swiss government bond indexes ($default_t$). In addition, I take global versions of these bond risk factors (gov_t^{global}, $default_t^{global}$) into account because the low pairwise correlations between these risk factors, presented in section 2.2, suggest that Swiss and global bond market risk factors capture different dimensions of risk.

The baseline regression then is

$$r_t^{i,e} = a^i + g^i gov_t + d^i default_t + g^i_{global} gov_t^{global} + d^i_{global} default_t^{global} + \varepsilon_t^i \quad (8)$$

Table 4 presents the estimates from equation (8) when I examine excess returns on bonds issued by Swiss non-government entities from three different credit rating ranges as dependent variables (panel A) and their counterparts issued by foreign governments (panel B) or foreign corporates (panel C). T-statistics are Newey-West corrected (Newey and West, 1987). The R^2 statistic is adjusted for the number of regressors. The regression coefficient for the constant is multiplied with 25000 to express the estimate in percentage points per annum (250 trading days times 100) for expositional purposes.

Three observations in panel A of table 4 are noteworthy. First, the overall measure of fit is quite high with R^2 statistics of about 90%. In terms of measures of fit, the Fama and French (1993) model is a good description of the time variation in Swiss CHF bond excess returns. Second, we observe positive and significant estimates of the constant in the regressions. Depending on the credit rating range, Swiss bonds offered excess returns that were on average between 0.6% p.a. (AAA-AA credit rating range) and 0.9% p.a. (AAA-BBB credit rating range) higher over the sample period than suggested by their risk factor sensitivities. The differences between the credit rating ranges suggests that the bonds from the broadest credit rating range and thus of, on average, poorest credit quality provided the highest abnormal returns. As emphasized by Black et al. (1972), a well specified asset pricing model should deliver estimates of the constant that are zero when excess returns are regressed on other excess returns or returns on zero net investment strategies. Hence, the evidence of "abnormal" positive returns suggests that the bond market risk factors are not sufficient to explain average returns on Swiss non-government bonds. The final noteworthy observation in panel A of table 4 is the stark difference between the exposures to the Swiss and global bond risk factors. The regression coefficients for the Swiss bond risk factors are considerably higher than their counterparts for the global bond risk factors. The sensitivity to the Swiss government bond excess return varies between 0.6 and 0.7 while the respective sensitivities to the global bond market return are about 0.04. A similar pattern is visible for the exposures to the Swiss and global corporate bond spreads. This observation suggests that Swiss bonds are best described by their sensitivities to Swiss risk factors during the sample period. Global bond market risks seem to play a minor role.[6]

The results for excess returns on CHF bonds issued by foreign corporates (panel B) and foreign governments (panel C) stand in marked contrast to the evidence for Swiss bonds not only because the measures of fit are lower than those reported in panel A. Several other differences stand out. First, the sensitivities of foreign issued CHF bond excess returns to the Swiss government bond factor are about 50% lower than the sensitivities of their Swiss counterparts. The regression coefficients vary between 0.3 and 0.4. Second, their sensitivities to the global risk factors are five times higher than global bond risk factor exposures of the Swiss bonds. Judged by the sensitivities and average returns on the bond factor mimicking portfolios, Swiss and global risks seem to be equally important for average returns on CHF denominated bond indexes of foreign issuers. By contrast, Swiss bond returns are predominantly determined by sensitivities to Swiss risk factors. The third interesting feature reported in panel B and C of table 4 is the observation of almost equal risk factor sensitivities irrespective if we regard bonds issued by foreign corporates or foreign governments. The only variation in risk factor sensitivities occurs across credit rating ranges. This evidence suggests that investors in CHF denominated bonds of foreign issuers focus on the credit rating as measure of the underlying credit and default risk. The distinction between corporate or government borrower does not seem to play a decisive role in determining average returns. Finally, and most importantly, there is no evidence of significant risk-adjusted ("abnormal") excess returns on CHF bonds issued by foreigners. Despite the same credit ratings and the

[6] The inclusion of the global bond market risk factors only marginally improves the regression fit for the Swiss bond excess returns when adjusting for the number of regressors. This result is not reported but available upon request.

same currency denomination, only bonds issued by Swiss entities offer higher returns than suggested by their exposures to bond risk factors. This finding suggests that indeed investors searched for exposure to particular countries, in this case Switzerland, during the recent crisis periods.

[about here Table 4]

4.2 Including stock market risk factors

The evidence presented in 4.1 suggests that the baseline empirical model is not well specified since the risk factors do not capture all of the determinants of average returns on the Swiss CHF bond indexes. In addition, the fit of the model for the excess returns on CHF bonds issued by foreigners leaves room for improvement.

Therefore, I additionally take the three stock market risk factors proposed by Fama and French (1993) into account and run the following regressions

$$\begin{aligned} r_t^{i,e} &= a^i + g^i gov_t + d^i default_t + g^i_{global} gov_t^{global} + d^i_{global} default_t^{global} \\ &+ m^i r_t^{M,e} + s^i SMB_t + h^i HML_t + \varepsilon_t^i \end{aligned} \tag{9}$$

As before the left-hand variable is the log return on bond index *i* in excess of the 3M CHF Libor rate on day (month) *t*. The additional risk factors are the excess return on the Swiss proxy of the market portfolio ($r_t^{M,e}$), the return on the zero net investment strategy of going long in small and shorting large Swiss stocks (SMB_t) and the return on the zero net investment strategy of going long in Swiss stocks with high book-to-market equity ratios and shorting stocks with low book-to-market equity ratios (HML_t).

I deliberately focus on the Swiss versions of these risk factors to tackle the issue of the positive risk-adjusted returns on Swiss bonds. Griffin (2002) shows that the Fama and French (1993) factors are rather country-specific than global risk factors such that employing the Swiss stock market factors should be best suited to explain the “alphas” of Swiss bonds. Table

5 presents the results from the regression (9). The regression coefficients on the stock market risk factors are multiplied with 100 for expositional purposes.[7]

The most important message from the estimates presented in panel A of table 5 is that the evidence of positive risk-adjusted returns on Swiss bonds prevails. Including stock market risk factors leaves this result unaffected. In addition, significant estimates of the Swiss bond returns' sensitivities to the stock market factors have a negative sign. These assets hence provided a hedge against the risks mimicked by these portfolios over the sample period.

Panel B and panel C of table 5 provide a different picture for the excess returns on CHF bonds issued by foreign corporates and foreign governments. In contrast to the evidence for the Swiss bonds, including the stock market risk factors improves the adjusted R^2 statistic by about five percentage points. Moreover, all of the foreign CHF bond returns are positively related to the Swiss market returns and to the Swiss version of HML, a factor that could be interpreted as measure of financial distress (Kapadia, 2011) though there is still controversy about the interpretation of this factor (e.g. Campbell et al., 2008).

In sum, including stock market risk factors reinforces the impression that Swiss and foreign issued CHF bond returns have been determined differently since the global financial crisis despite the same currency denomination of the bonds and the same credit rating ranges. The CHF bonds issued by foreigners are not only more strongly related to global bond market risks but co-vary more positively with stock market risk factors than their Swiss counterparts. By contrast, Swiss bonds offered a hedge against stock market risks.

[about here Table 5]

4.3. Uncertainty and abnormal excess returns on Swiss bonds

The evidence presented so far leaves the impression that Swiss bonds have been priced differently from their counterparts issued by foreigners of the same credit and default risks (as measured by ratings of international credit rating agencies) and currency denomination.

[7] As shown in section 2, bond returns vary a lot less than stock returns such that the coefficients in regressions of bond returns on returns on risk factors constructed from stock market data are very small.

Moreover, conventional risk factors fail to capture the average returns on Swiss bonds as we observe positive risk-adjusted returns on these bonds over the sample period. Since the sample is characterised by various crisis periods, it appears to be the case that investors flock to Swiss bonds in crisis times thus pushing their prices higher than suggested by fundamentals. The results are positive risk-adjusted excess returns on the Swiss bonds.

This line of reasoning is reminiscent of empirical assessments of the 'safe haven' status of Swiss franc exchange rates. Ranaldo and Söderlind (2010) use high frequency data to show that Swiss franc exchange rates tend to appreciate when uncertainty, as measured by stock market volatility levels, is high. This observation occurs irrespective of the source of uncertainty, e.g. in times of a natural catastrophe or a financial crisis. Exposure to the relatively solid Swiss economy (Habib and Stracca, 2012) seems to be particularly attractive for investors when faced with high uncertainty or increasing uncertainty (Grisse and Nitschka, 2013). A similar reasoning could apply to the CHF bond market as well.

A closer look at the time variation in the abnormal returns, i.e. the regression coefficients of the constant plus the residuals from the regressions introduced in equation (9), indeed conveys the notion that there might be a link between the positive risk-adjusted returns and a proxy of uncertainty such as stock market volatility. Figure (2) provides the smoothed time series of abnormal returns on the three bond indexes of CHF bonds issued by Swiss non-government borrowers. The smoothing follows Campbell et al. (2013).

It is clearly visible in figure (2) that the abnormal returns on Swiss bonds turned abruptly positive around October/November 2008 and stayed positive thereafter but at lower levels. The timing of the sharp increase in the abnormal returns coincides with high volatility levels at the height of the global financial crisis around the collapse of Lehman Brothers (see figure (1) for the time series of volatility indexes).

[about here Figure 2]

It is hence natural to assess if there is not only a link between Swiss franc exchange rate dynamics but also of Swiss CHF bond returns and stock market volatility. Therefore, I add the level of the option-implied Swiss stock market volatility index, *VSMI*, as regressor to the other risk factors and run the following regressions

$$\begin{aligned} r_t^{i,e} &= a^i + g^i gov_t + d^i default_t + g^i_{global} gov_t^{global} + d^i_{global} default_t^{global} \\ &+ m^i r_t^{m,e} + s^i smb_t + h^i hml_z + v^i vsmi\_o_t + \varepsilon_t^i \end{aligned} \qquad (10)$$

where $vsmi\_o_t$ denotes that part of *VSMI* that is uncorrelated with the other risk factors. It is obtained from the regression

$$\begin{aligned} VSMI_t &= \mu + g * gov_t + d * default_t + g_{global} gov_t^{global} + d_{global} default_t^{global} \\ &+ m^i r_t^{m,e} + s^i smb_t + h^i hml_t + e_t \end{aligned} \qquad (11)$$

and defined as $vsmi\_o_t = \mu + e_t$. Since stock market volatility tends to rise when stock prices fall, this orthogonalisation is an attempt to focus on the impact of volatility as a proxy of uncertainty. In addition, I chose to present the results obtained from the Swiss stock market volatility proxy instead of the more popular VIX because of the daily frequency of the data. Mixing US and Swiss daily data could result in timing difficulties because of the different time zones.

Table 6 presents selected estimates from the regressions introduced in equation (10). As the stock market volatility index is orthogonalised to the other risk factors, the table just presents the estimates of the constant and the regression coefficient on $vsmi\_o_t$ for all bond indexes under study. The other regression coefficients remain unchanged.

The estimates in table 6 show that controlling for uncertainty removes the positive risk-adjusted returns on Swiss bonds. In fact, the estimates of the “abnormal” return turn even negative but are insignificant at conventional significance levels with the exception of the Swiss bonds in the narrowest AAA-AA credit rating category. At the same time, the sensitivities to the stock market volatility levels are positive and significant meaning that Swiss bonds paid off well and thus offered high returns when uncertainty was high. By contrast, there is no link between the excess returns on foreign CHF bonds and the uncertainty proxy.

[about here Table 6]

4.4 Summary of robustness checks

This section summarizes the results of several robustness checks which are not reported to save space but are available upon request. The first robustness check concerns the data frequency. All of the results hold when the data is measured at the monthly frequency. Because of fewer time series observations the regression coefficients are less precisely estimated but the qualitative conclusions regarding the differences between Swiss and foreign bonds remain unaffected.

Moreover, controlling for the average duration of the CHF bonds leaves all of the qualitative results unaffected. We observe growing differences in the average duration of Swiss CHF bonds and the CHF bonds issued by foreigners since about 2010/2011. These duration differences, however, cannot account for the differences in risk factor sensitivities and the significance of risk-adjusted returns on Swiss bonds as opposed to their foreign counterparts.

Furthermore, one might wonder if the link between stock market volatility and the risk-adjusted returns on the Swiss bonds is the result of uncertainty at the global level and thus the product of particularly foreign demand for Swiss bonds. This question is difficult to answer in the present context as the VSMI and the VIX are strongly positively correlated as presented in figure (1). Therefore, it is probably not too surprising that repeating the empirical exercises of equations (10) and (11) with the VIX instead of the VSMI delivers basically the same results.

5 Conclusions

This paper has used data from the CHF bond market to assess the question if the financial crisis periods since 2007 can be characterised as times in which investors search for assets that expose them to specific countries or groups of countries. Using the CHF bond market as an example, the evidence presented in this paper shows that investors clearly distinguish between Swiss and foreign issuers of CHF bonds even when the credit and default risks, as measured by international credit ratings, are the same. This difference is best visible in the positive risk-adjusted excess returns on CHF bonds issued by Swiss entities in contrast to insignificant risk-adjusted returns on bonds issued by foreigners.

The different investor perceptions of Swiss and foreign bonds are also reflected in the sensitivities to risk factors. In the sample period from 2007 to 2014, Swiss non-government bonds have mostly been exposed to Swiss bond market risk factors and provided a hedge against stock market risks. By contrast, foreign bond returns have been more sensitive to global risk factors and co-varied positively with stock market risk factors.

Insights from the assessment of the “safe haven” characteristic of Swiss franc exchange rates help to make sense of the evidence of risk-adjusted returns on Swiss bonds. Controlling for levels of stock market volatility – as proxy of uncertainty –in addition to the Fama and French (1993) risk factors eliminates the evidence of abnormal returns. This finding underscores the importance of taking volatility as influencing factor of asset returns into account (Campbell et al., 2014; Menkhoff et al., 2012). It also suggests that investors flock to assets of specific countries, such as Switzerland, in times of uncertainty.

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Tables

Table 1: Descriptive statistics of excess returns on bond and sectoral stock indexes

	Swiss non-government			Foreign corporates		
	AAA-AA	AAA-A	AAA-BBB	AAA-AA	AAA-A	AAA-BBB
Mean	0.0101	0.0104	0.0106	0.0083	0.0085	0.0092
SD	0.1676	0.1553	0.1494	0.1544	0.1498	0.1493
SR	0.0604	0.0672	0.0708	0.0536	0.0564	0.0613

	Foreign government		
	AAA-AA	AAA-A	AAA-BBB
Mean	0.0051	0.0052	0.0059
SD	0.1549	0.1503	0.1498
SR	0.0326	0.0348	0.0396

Notes: This table provides mean excess returns (mean), their standard deviations (SD) as well as the Sharpe ratios (SR) of nine total return indexes of CHF denominated bonds. The bonds are issued by three different types of issuers: Swiss non-government, Foreign corporates and foreign government. Within each issuer category, there is a distinction between different credit ratings ranges from narrow and high quality (AAA-AA) to the widest range: AAA-BBB. All moments are expressed in % per day. The sample period runs from 3 January 2007 to 14 March 2014.

Table 2: Descriptive statistics and pairwise correlations

of Swiss and global bond risk factors

Panel A: Descriptive statistics

	gov	default	gov(global)	default (global)
mean	0.0101	0.0003	0.0164	0.0015
SD	0.2302	0.1434	0.4306	0.3843

Panel B: Pairwise correlations

	gov	default	gov(global)	default (global)
gov	1	-0.27	0.34	-0.07
default		1	-0.11	0.09
gov (global)			1	-0.84
default (global)				1

Notes: This table presents descriptive statistics (panel A) as well as pairwise correlations (panel B) of Swiss and global bond market risk factors. The Swiss bond market risk factors are the excess return on a Swiss government bond index (gov) and the return difference between non-government CHF bonds (domestic and foreign , 7 – 10 years maturity, ratings ranging from AAA to BBB) and the return on a Swiss government bond index (7 – 10 years maturity, ratings ranging from AAA to BBB). This return is abbreviated with "default". In addition, panel A provides the corresponding statistics for global bond market counterparts: The excess return on the Bank of America Merrill Lynch global government bond index (gov (global)) and the return difference between the Bank of America Merrill Lynch global corporate bond index and the corresponding global government bond index (default(global)). All moments of returns are expressed in % per day. The sample period runs from 3 January 2007 to 14 March 2014.

Table 3: Descriptive statistics and pairwise correlations

of Swiss stock and bond market risk factors

Panel A: Descriptive statistics

	Market	SMB	HML
mean	0.0014	0.0072	-0.0121
SD	1.2573	0.8706	0.7184

Panel B Pairwise correlations

	Market	SMB	HML	gov	default
Market	1	-0.57	0.28	-0.42	0.20
SMB		1	-0.49	0.14	-0.08
HML			1	-0.15	0.06
gov				1	-0.27
default					1

Notes: Panel A of this table provides mean excess returns (mean) and the standard deviations (SD) of the Swiss varieties of stock market risk factors proposed by Fama and French (1993). These risk factors are the excess return on a broad Swiss stock market index (Market), the return on the zero net investment strategy to buy small stocks and sell large stocks (SMB) and the returns on the zero net investment strategy to buy stocks with high ratios of book-to-market equity and sell stocks with low ratios of book-to-market equity (HML) All moments of returns are expressed in % per day. The sample period runs from 3 January 2007 to 14 March 2014. Panel B of this table displays the pairwise correlations of these three stock market risk factors and also their correlations with the two Swiss bond market factors presented in table 2.

Table 4: CHF bond returns: sensitivities to Swiss and global bond risk factors

Panel A: Swiss non-government bonds						
	a (* 25000)	*g*	*d*	g^{global}	d^{global}	R^2
AAA-BBB	0.87 ** (3.37)	0.61 ** (43.57)	0.35 ** (20.21)	0.04 ** (7.00)	0.04 ** (5.74)	0.90
AAA-A	0.78 ** (2.87)	0.64 ** (44.78)	0.36 ** (20.22)	0.04 ** (7.10)	0.04 ** (5.34)	0.90
AAA-AA	0.60 ** (1.97)	0.70 ** (46.94)	0.37 ** (18.25)	0.03 ** (4.97)	0.03 ** (3.48)	0.90

Panel B: Foreign corporates						
	a (* 25000)	*g*	*d*	g^{global}	d^{global}	R^2
AAA-BBB	0.58 (0.64)	0.32 ** (6.89)	0.31 ** (6.40)	0.19 ** (4.16)	0.21 ** (3.57)	0.49
AAA-A	0.38 (0.44)	0.33 ** (7.35)	0.31 ** (6.59)	0.19 ** (4.19)	0.21 ** (3.59)	0.51
AAA-AA	0.25 (0.30)	0.40 ** (9.13)	0.33 ** (7.64)	0.17 ** (4.15)	0.19 ** (3.56)	0.57

Panel C: Foreign government						
	a (* 25000)	*g*	*d*	g^{global}	d^{global}	R^2
AAA-BBB	−0.24 (−0.25)	0.32 ** (6.85)	0.31 ** (6.40)	0.20 ** (4.16)	0.21 ** (3.58)	0.49
AAA-A	−0.43 (−0.47)	0.33 ** (7.31)	0.31 ** (6.59)	0.19 ** (4.18)	0.21 ** (3.60)	0.51
AAA-AA	−0.56 (−0.66)	0.40 ** (9.08)	0.34 ** (7.63)	0.18 ** (4.15)	0.19 ** (3.57)	0.57

Notes: This table presents estimates from regressions of daily excess returns on total return indexes of CHF denominated bonds on a constant (*a*) the excess return on Swiss government bonds (*g*) and the return difference between long-term non-government and Swiss government bond indexes (*d*) as well as on their global counterparts (g^{global}, d^{global}).
The CHF bonds are grouped into three categories on the basis of the range of credit ratings. The AAA-BBB group basically comprises all bonds issued by a specific issuer group. The two other categories are restricted to bonds with a specific minimum credit rating, A or AA respectively. The bond indexes distinguish between the following issuer categories: Swiss non-government (panel A), foreign corporates (panel B) and foreign government (panel C).
The regression coefficients on the constant is multiplied with 25000 for expositional purposes. Newey-West corrected t-statistics appear below the estimates in parenthesis. The R^2 statistic is adjusted for the number of regressors. The sample period runs from 3 January 2007 to 14 March 2014. * and ** indicate significance at 90% and 95% level.

Table 5: CHF bond returns: sensitivity to stock and bond risk factors

Panel A: Swiss non-government bonds

	a (* 25000)	*g*	*d*	g^{global}	d^{global}	*m* (* 100)	*s* (* 100)	*h* (* 100)	R^2
AAA -BBB	0.88 ** (3.44)	0.61 ** (42.72)	0.35 ** (19.87)	0.05 ** (6.61)	0.04 ** (5.66)	− 0.21 (−0.87)	− 0.51** (2.00)	− 0.21 (−1.17)	0.90
AAA -A	0.78 ** (2.97)	0.63 ** (43.16)	0.36 ** (19.91)	0.04 ** (6.76)	0.04 ** (5.35)	− 0.30 (−1.31)	− 0.60 ** (−2.19)	− 0.32 * (−1.63)	0.90
AAA- AA	0.61 ** (2.10)	0.69 ** (44.27)	0.37 ** (18.26)	0.03 ** (5.41)	0.03 ** (3.82)	− 0.51** (−2.54)	− 0.74 ** (−2.65)	− 0.54 ** (−2.45)	0.90

Panel B: Foreign corporates

	a (* 25000)	*g*	*d*	g^{global}	d^{global}	*m* (* 100)	*s* (* 100)	*h* (* 100)	R^2
AAA -BBB	0.45 (0.53)	0.38 ** (14.84)	0.28 ** (6.23)	0.20 ** (4.60)	0.23 ** (4.11)	2.40 ** (2.47)	− 0.36 (−0.56)	1.78 ** (3.01)	0.54
AAA -A	0.27 (0.32)	0.39 ** (15.23)	0.29 ** (6.43)	0.20 ** (4.61)	0.21 ** (4.12)	2.13 ** (2.26)	− 0.63 (−0.96)	1.64 ** (2.79)	0.55
AAA -AA	0.16 (0.19)	0.44 ** (18.15)	0.32 ** (7.52)	0.18 ** (4.58)	0.19 ** (4.09)	1.69 * (1.91)	− 1.04 * (−1.85)	1.39 ** (2.70)	0.61

Panel C: Foreign government

	a (* 25000)	*g*	*d*	g^{global}	d^{global}	*m* (* 100)	*s* (* 100)	*h* (* 100)	R^2
AAA -BBB	− 0.36 (−0.41)	0.38 ** (14.79)	0.29 ** (6.24)	0.20 ** (4.60)	0.22 ** (4.12)	2.44 ** (2.50)	− 0.33 (−0.52)	1.80 ** (3.05)	0.54
AAA -A	− 0.54 (−0.62)	0.39 ** (15.18)	0.29 ** (6.43)	0.20 ** (4.61)	0.21 ** (4.13)	2.17 ** (2.28)	− 0.60 (−0.92)	1.66 ** (284)	0.55
AAA -AA	− 0.66 (−0.79)	0.44 ** (18.09)	0.32 ** (7.52)	0.19 ** (4.58)	0.20 ** (4.10)	1.72 * (1.94)	− 1.01* (−1.82)	1.41 ** (2.76)	0.61

Notes: This table presents estimates from regressions of daily excess returns on total return indexes of CHF denominated bonds on a constant (*a*) the excess return on Swiss government bonds (*g*) and the return difference between long-term non-government and Swiss government bond indexes (*d*) as well as on their global counterparts (g^{global}, d^{global}). In addition, the regressions take three stock market risk factors into account: market excess returns (*m*), SMB (*s*) and HML (*h*).
The CHF bonds are grouped into three categories on the basis of the range of credit ratings. The AAA-BBB group basically comprises all bonds issued by a specific issuer group. The two other categories are restricted to bonds with a specific minimum credit rating, A or AA respectively. The bond indexes distinguish between the following issuer categories: Swiss non-government (panel A), foreign corporates (panel B) and foreign government (panel C).
The regression coefficients for the constant is multiplied with 25000 and the regression coefficients for the stock market risk factors are multiplied with 100 for expositional purposes. Newey-West corrected t-statistics appear below the estimates in parenthesis. The R^2 statistic is adjusted for the number of regressors. The sample period runs from 3 January 2007 to 14 March 2014. * and ** indicate significance at 90% and 95% level.

Table 6: Exposure to stock market volatility and the impact on risk-adjusted returns

	Swiss non-government		Foreign corporates		Foreign government	
	a	*v*	*a*	*v*	*a*	*v*
	(* 25000)	*(*25000)*	(* 25000)	*(*25000)*	(* 25000)	*(*25000)*
AAA-BBB	−1.18 (−1.14)	0.10 * (1.83)	0.78 (0.26)	− 0.02 (−0.10)	0.63 (0.21)	− 0.05 (−0.29)
AAA-A	−1.49 (−1.43)	0.11 ** (2.00)	0.44 (0.15)	− 0.01 (−0.05)	0.28 (0.10)	− 0.04 (−0.25)
AAA-AA	−1.79 * (−1.74)	0.12 ** (2.11)	0.34 (0.12)	− 0.01 (−0.06)	0.18 (0.06)	− 0.04 (−0.26)

Notes: This table presents estimates from regressions of daily excess returns on total return indexes of CHF denominated bonds on a constant (*a*), the excess return on Swiss government bonds and the return difference between long-term non-government and Swiss government bond indexes as well as on their global counterparts. In addition, the regressions take three stock market risk factors into account: market excess returns, SMB and HML. Moreover, the regressions use the level of the option-implied volatility index of the Swiss stock market index (VSMI) as additional control. This volatility index is orthogonalised relative to the other risk factors. The respective regression coefficient is abbreviated with "*v*".
The CHF bonds are grouped into three categories on the basis of the range of credit ratings. The AAA-BBB group basically comprises all bonds issued by a specific issuer group. The two other categories are restricted to bonds with a specific minimum credit rating, A or AA respectively. The bond indexes distinguish between the following issuer categories: Swiss non-government (panel A), foreign corporates (panel B) and foreign government (panel C).
The regression coefficients for the constant and the VSMI are multiplied with 25000 for expositional purposes. Newey-West corrected t-statistics appear below the estimates in parenthesis. The sample period runs from 3 January 2007 to 14 March 2014 * and ** indicate significance at 90% and 95% level.

Figures

Figure 1: Time series of option-implied stock index volatility measures (VSMI and VIX)

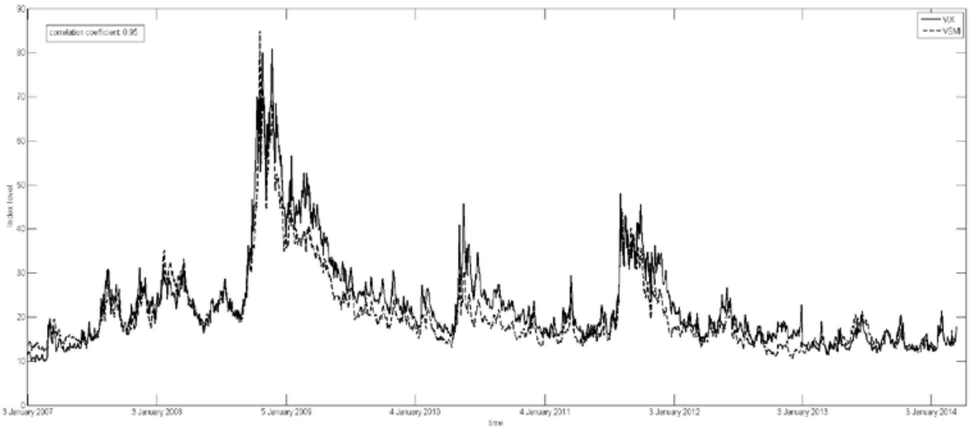
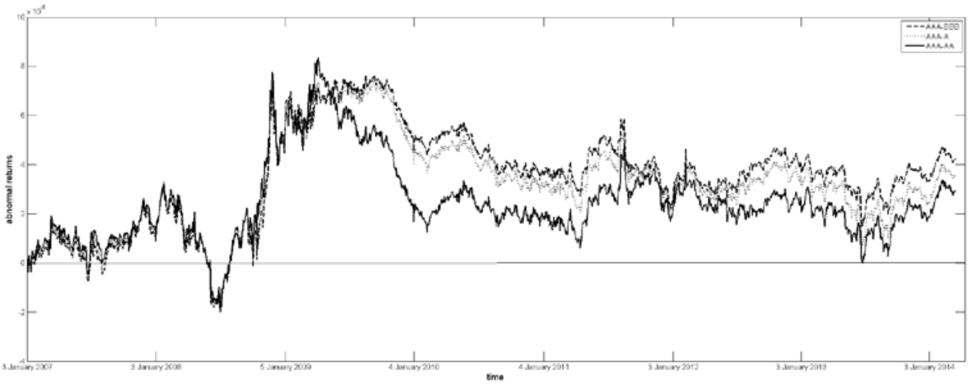


Figure 2: Smoothed time series of abnormal excess returns on Swiss bonds.



Notes: The solid, dotted and dashed lines represent the smoothed time series of the abnormal returns on CHF bonds issued by Swiss, non-government entities distinguishing between three different credit rating ranges. The smoothing follows Campbell at al. (2013) in using a trailing, exponentially weighted moving average with the decay parameter set to 0.004 as the data is daily. The sample period runs from 3 January 2007 to 14 March 2014. The moving average is defined as $MA_t(ar) = 0.004*ar_t + (1-0.004)*MA_{t-1}(ar)$.

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