IMPACT OF INFLATION RATE ON DEMAND FOR ALTERNATIVE CURRENCY:

CASE STUDY FOR SWITZERLAND'S WIRTSCHAFTSRING

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Abstract

The Swiss Wirstchaftsring credit network has increasingly become a center of attention, especially for economists interested in alternative currencies. The length of historical data on this currency along with its widespread use triggers a question about the factors behind the substantial size of its turnover. This study examines the relationship between the inflation rate of the Swiss Franc and the demand for the alternative currency the Swiss Wirtschaftsring (WIR). The utilization of a Vector Autoregressive model establishes Granger causality from the inflation rate to the money demand for the WIR currency. A supplemental regression model incorporates interest rate on mortgage loans serving as a proxy for the inflation rate to avoid time-series associated problems. The findings from this paper will serve as a constitutive source for crafting more effective monetary policies through considering the positive effect of inflation rate of legal tender on the demand for the alternative currency.

Key words: Swiss Wirtschaftsring, WIR, Alternative currency, VAR

JEL Code: E51, G21

Introduction

The spread of alternative currencies over the last decades have been remarkable. Hundreds of them appear in circulation inspiring various social scientists to study their effects and importance for economies (e.g. Greco, 2001; Andrew, 2001 or Hogan, 2012). This paper's subject, the impact of inflation rate on money demand for alternative currencies,provides statistical evidence for the currency Switzerland's Wirtschaftsring (WIR).

The WIR is very suitable for statistical testing, as it has a long and significant presence in the domestic economy. In 2003, the participants generated a business volume of 1,43 billion CHW. (Rapport de gestion, 2003) It constitutes 0.165 percent of money supply in respect to the domestic monetary aggregate M2.(Stodder, 2009)

My diploma thesis provides money in the utility function model with simulation revealing positive causality leading from a rise of inflation rate of legal tender to an increase of the demand for an alternative currency. The choice of the variable inflation rate as a determinant of demand for an alternative currency originates in the study of Colacelli and Blackburn (2005). They consider it as one of the main factors for currency substitution.

On the other hand, the study of Krohn and Snyder (2008) refute such a relationship based on data between 1991 and 2004 in the United States. The American economy exhibited economic as well as price stability between these years. These authors conclude that high inflation rates or low economic growth are poor indicators for the widespread issuance of local currencies during the period. The main goal of this paper is to question the relevance of the results for the case of WIR currency.

Hogan (2012) suggests an opposite causal effect where the competition of currencies brings about an increase in economic and price stability. Stodder (2009) proves a stabilization effect of the WIR currency on Swiss economy. To control for the possibility of a reciprocal relationship between money demand for the alternative currency WIR and inflation rate of legal tender, this research paper integrates a vector autoregression model.

Finally, there are many which posit there is a reduction in money demand as a consequence of high inflation (See for example, Greco (2001), Camera, Craig or Waller (2003)). Testing the real effect of the inflation rate variable on the money demand for the Swiss alternative currency WIR will reveal positive causality from the inflation rate of the Swiss Franc to the demand for the alternative currency.

The structure of the paper will proceed in the following manner. First, there will be an analysis of data for the proper model construction. Second, the methodology will feature the results in a vector error correction model, which identifies the relationship between money demand for WIR and inflation rate of legal tender. Finally, this paper concludes with a summary of the results of the overall research.

1 Data Analysis

Total WIR Turnover represents the money demand variable for individual years. It accounts for the total WIR money in circulation. The alternative currency operates cashless and on a similar basis as other currencies such as the Swiss Franc; the supply of the WIR currency is driven by its demand via credit provided through the WIR Bank. It is then possible to assume endogeneity of money supply. The total WIR Turnover should serve as a valid proxy for

demand for this currency. Yildirim (2003) describes such a current empirical assumption about equality between demand for money and money stock. There are other models used which apply money aggregates to model money demand. (See Alrt et al. (2001) for the case of the Czech Republic)

Data on this variable are combined from the study of Stodder (2009), who provides data since 1948 until 2003 and individual Rapport de Gesture for the WIR currency. The website of the Federal Statistical Office in Switzerland provides data on inflation rate and Swiss National Bank publishes historical data on the variable Swiss Franc LIBOR interest rate as well as on the interest rate for mortgage loans. The Table 1 provides summary statistics for individual variables.

The Swiss National Bank has not started to target inflation rate until 1999, which explains the limitation of data on Swiss Franc LIBOR interest rate. (Gerlach& Jordan, 2011). However, since the 1980s the central bank has used foreign exchange swaps as its chief instrument based on SFr LIBOR. (Olivei, 2002 and McCormik, 2011) The data on Swiss Franc LIBOR have been available on the Swiss National Bank website since 1989 and the data for interest rate on mortgage loans are available since 1948 until 2013. Inflation rates have been available for the full period between 1948 and 2013 and the Turnover variable has been accessible for the same period with an exception of the years 2004, 2005 and 2006.

Tab. 1: Summary Statistics

	IR	TURNOVER	INFLATION	LIBOR
Mean	4.420212	798.3603	2.422727	2.583538
Median	4.2385	247.5	1.85	1.6285
Maximum	7.18	2521	9.8	8.954
Minimum	2.02	1.1	-1.6	0.014
Std. Dev.	1.178033	845.366	2.341978	2.724366
Skewness	0.217856	0.655813	0.930294	1.161412
Kurtosis	2.414572	1.836457	3.71078	3.18126
Jarque-Bera	1.464571	8.069761	10.90924	5.880734
Probability	0.480809	0.017688	0.004277	0.052846
Sum	291.734	50296.7	159.9	67.172

Sum Sq. Dev.	90.20448	44307904	356.5159	185.5542
Observations	66	63	66	26

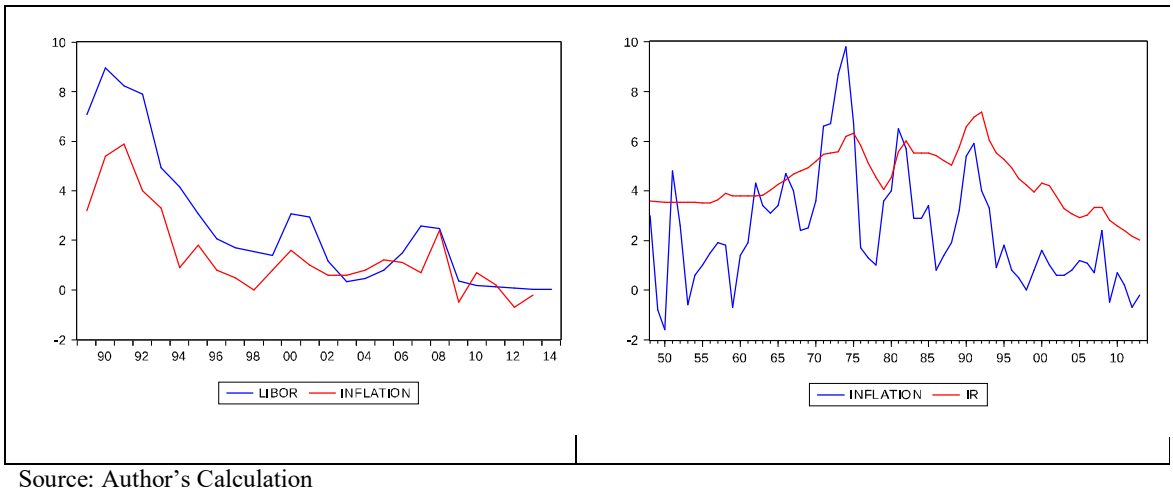
Source: Own analysis.

2 Methodology

The analysis of the effect of inflation rate on money demand for the currency WIR will consist of two steps. In the first step, an augmented Dickey-Fuller's test (ADF) controls for "stationarity" of time series. The test indicates stationarity of inflation rate and SFr LIBOR interest rate but non-stationarity of the time series IR on mortgage loans and the WIR Turnover. Both of these non-stationary stochastic processes are integrated of degree one I(1). In order to reveal the relationship between inflation rate and the WIR Turnover, I follow the procedure of Arlt et al. (2001), who tests the impact of inflation rate on the money demand in the Czech Republic through its effect on the Czech PRIBOR interest rate. However, instead of using the main operational tool of the Swiss National Bank, the three months LIBOR, the interest rate on mortgage loans (IR) serves as a proxy variable included into the model, which is integrated of the same degree as the variable of interest–the WIR Turnover.

Figure 1 on the left proves a similar evolution of the inflation rate and Swiss Franc LIBOR since 1989. Although, the Swiss National Bank started to target inflation rate in 1999, using the LIBOR as its main monetary instrument, since 1974 the Swiss National Bank (SNB) started to follow monetary base, which affected contemporaneous inflation rate, an ultimate objective of SNB. (Kohli& Rich, 1986) The attempt to strengthen the inflationary policy to fight against high levels of inflation affected inflation expectation resulting in the reduction of nominal interest rates (such as the interest rate on mortgage loans) (See the right side of Figure 1). This positive correlation between nominal interest rate and expected inflation relates to the Fisher equation.

Fig. 1: TheevolutionofSwiss Franc LIBOR and Interestrate on MortgageLoans and Inflationrate



Source: Author's Calculation

Subsequently, in the 1980s the SNB started to use foreign exchange swaps based on SFr LIBOR as its chief instrument as was already mentioned. (Olivei, 2002 and McCormik, 2011) It also explains high correlation rate between inflation rate and SFr LIBOR equal to 0,922 as well as a rise in the correlation between inflation rate and other nominal interest rates such as the interest rate on mortgage loans.

The inflation rate variable reveals to be a stationary stochastic process and cannot be then used in the VAR model with the WIR Turnover non-stationary stochastic process. The nominal interest rate is traditionally the sum of the real rate and expected inflation, the Fisher equation. If one assumes rather adaptive inflationary expectations with approximately constant real interest rate, nominal interest rates behave in a similar way as inflation rate. (Arlt et al., 2001, p. 14) Figure 1 proves such a similar relationship.

Given the stationary nature of the LIBOR, it is not possible to provide a valid analysis of its impact on the WIR Turnover alone. Therefore, the interest rate on mortgage loans, which is highly correlated with LIBOR (correlation coefficient of 0.92) as well as with the inflation rate (0.71) since 1974 will serve as the final variable incorporated into the model. Figure 1, the right side graph illustrates the increase of correlation between inflation rate and interest rate on mortgage loans after 1974, for the reason already explained in the previous paragraphs. The variable IR on mortgage loans will be incorporated for the period between 1974 and 2013.

The next part of this paper results in a construction of a suitable model for statistical estimation. First, I estimate and verify the appropriate VAR model in a statistical software,

which reveals a Cointegration Rank Test to prove my hypothesis about cointegrating the relationship between the demand for WIR and inflation rate of SFr. Based on this result, the vector error correction model presents results for Granger causality between the time series in the Table 2.

3 Estimation of the Effect of Inflation Rate on the Demand for WIR

This part focuses on the estimation of the effect of inflation rate connected with Swiss franc on the money demand for an alternative currency WIR. Estimation of VAR model with three lags takes place in the program Eviews. This model serves as a middle step to disclose a potential cointegrating relationship between the two time series. The chief element of such a procedure is a development of the Vector error correction model (VECM), which discloses the hypothesis of interest.

All the variables appear in the VAR model in logarithmic form. The R-squared of the model is 99.87 percent. This part of the model construction necessitates testing the validity of the model before a valid VECM can be established. Since no root lies outside of the unit circle, VAR satisfies the stability condition. Correlogram reveals no autocorrelation of the error term as well as the VAR Residual Serial Correlation LM Test. The residuals appear as is normally distributed proved by a Jarque-Bera test with p-value 0.828. A White heteroskedasticity test cannot reject homoscedasticity of residuals on 5 % level of significance, given the p-value 0.542. Lag exclusion in a Wald test as well as information criteria (FPE, HQ) supports the presented specification of the model with three lags.

The VAR model reveals a statistically significant effect of the variable IR in the third lag on the variable Turnover while the reciprocal relationship appears non-existing. Unrestricted Cointegration Rank Test supports the presence of cointegration at the 5 % level of statistical significance. Max-eigenvalue test indicates 2 cointegrating equations at the 5 % level of statistical significance.

VAR Granger Causality/Block Exogeneity Wald Tests demonstrate IR on mortgage loans as significantly Granger-cause of the variable WIR Turnover but WIR Turnover turns up to be Granger-cause of the variable IR on mortgage loans as well. Since the results of the Johansen's test favor the presence of a cointegrating equation, Vector error correction model tests the short-run and long-run relationship between the two variables of interest with following results:

Tab. 2: Vector Error Correction Estimates

Sample (adjusted): 1974 2013

Included observations: 34 after adjustments

Standard errors in ( )& t-statistics in [ ]

Cointegrating Eq:

LOG(TURNOVER(-1))	1.00000
LOG(IRMORTGAGE(-1))	-3.962934
	-0.33476
	[-11.8380]***
TREND(48)	-0.144021
Constant	5.657912

Error Correction:	**D(LOG(TURNOVER))**	**D(LOG(IR))**
CointEq1	0.055436	0.16478
	-0.02733	-0.04043
	[2.02868]**	[4.07592]***
D(LOG(TURNOVER(-1)))	0.595156	-0.276213
	-0.14512	-0.21469
	[4.10126]***	[-1.28656]
D(LOG(TURNOVER(-2)))	0.177928	0.41639
	-0.13812	-0.20435
	[1.28819]	[2.03767]**
D(LOG(IR(-1))	0.237921	0.77082
	-0.09119	-0.13491
	[2.60916]***	[5.71372]***
D(LOG(IR(-2))	0.349087	0.175043
	-0.12511	-0.18509

	[2.79027]***	[0.94570]
Constant	0.044456	-0.023685
	-0.03439	-0.05087
	[1.29289]	[-0.46559]
TREND(48)	-0.000454	0.000231
	-0.00077	-0.00113
	[-0.59311]	[0.20388]
R-squared	0.884896	0.660301
Adj. R-squared	0.859318	0.584813
Sum sq. resids	0.043934	0.096162
S.E. equation	0.040338	0.059679
F-statistic	34.59516	8.747032
Log likelihood	64.83034	51.51345
Akaike AIC	-3.401785	-2.618438
Schwarz SC	-3.087534	-2.304188

p-value < 0.01***, p-value < 0.05 **, p-value<0.1*

D in front of a bracket signals First Difference of the variable, which are in logarithmic forms (i. e. LOG).

Table 2 illustrates statistically significant a positive effect of the cointegrating equation on each of the endogenous variables. The model also demonstrates a statistically significant effect leading from the rate of return of the interest rate to the variable D(LOG(Turnover)). A reciprocal relationship is statistically significant only on the second lag. The effect on the rate of return of the interest rate on mortgage loans seems to be rather milder given its coefficients, a more accurate proxy could help reveal a more significant impact of the inflation rate on money demand for the WIR currency.

The positive response of money demand (see Graph 2 in Appendix) for alternative currency WIR to the interest rate on mortgage loans, which serves as a proxy for inflation rate, supports the theoretical premise of this paper. With the higher inflation rate of legal tender, individuals tend to switch to an alternative currency such as the WIR. The idea behind

such an inquiry is the higher willingness of individuals to substitute Swiss Franc for the WIR in the presence of inflation connected with Swiss Franc.

But it is not only in the line with the results of my diploma thesis it is also consistent with the studies of other authors such as Colacelli and Blackburn (2005), Greco (2001) and Camera, Craig and Waller (2003) who posit that individuals prefer stable currency. In the end, this result questions the outcome of Krohn's and Snyder's (2008) study, which does not view inflation rate as a factor explaining the alternative currency movement in the U.S. More thorough analysis is therefore required for the case of the demand for individual alternative currencies in the United States. An evolution of a currency's turnover with respect to the inflation rate variation could either prove or disprove the results in this paper also for other alternative currencies in various economies.

Conclusion

The topic of interest in this study is an analysis of money demand for an alternative currency Switzerland's Wirtschaftsring. In particular, it questions the inflation rate for the legal tender "Swiss Franc" as a significant factor for money demand variation of the WIR currency.

The empirical analysis tests such a relationship with the help of interest rates on mortgage loans, which serves as a proxy for inflation rate between 1974 and 2013. The reason for its inclusion is a stationary character of Swiss inflation rate in comparison to non-stationary character of the total turnover variable for the currency WIR. A Vector error correction model proves an existence of long-run equilibrium of the observed time series. Its result provides the proof for the Granger causality from inflation rate on money demand for the Swiss alternative currency WIR.

In sum, the rate of return of the nominal interest rate, in turn inflation rate, results in higher growth rate of the Turnover for the WIR currency proving the hypothesis of my previous theoretical paper as well as the papers of some other authors as stated in the literature review. This pragmatic instance provides an additional layer of solidarity to the argument about the preference of individuals for stable currency. Understanding this particular pattern of behavior is of a critical importance to the effective monetary policy making in countries with the presence of complementary currencies. It also serves as a supplementary incentive for issuing authorities to maintain low levels of inflation rates in relation to the price-level changes of alternative currencies.

Subsequent research should concentrate on other factors affecting money demand for alternative currencies or provide a wider spectrum of alternative currencies as an evidence to support the revealed relationship between inflation rate and money demand for an alternative currency. Another proxy for inflation rate could also help to prove its positive causal effect on money demand for the alternative currency WIR.

References

Andrew, L. (2001). Alternative Currencies in Theory and Practice, The Ithaca Model Examined in Northern California. Retrieved from http://www.andrewlowd.com/thesis/Contents.htm

ARLT, J.-G., RADKOVSKÝ, M., SOJKA, Š., & STILLER, M. (2001). Vliv vybraných faktorů na vývoj poptávky po penězích v letech. *Politická Ekonomie*, *49*(5), 635–657.

Camera, G., Craig, B., & Waller, C. J. (2003). Currency Competition in a Fundamental Model of Money. Federal Reserve Bank of Cleveland. Retrieved from http://ideas.repec.org/s/fip/fedcwp.html

Colacelli, M., & Blackburn, D. (n.d.). Secondary Currency: An Empirical Analysis. *Journal of Monetary Economics*, *56(2009)*(3), 295–308.

Gerlach, S., & Jordan, T. J. (2011). Tactics and Strategy in Monetary Policy: Benjamin Friedman's Thinking and the Swiss National Bank.

Greco, T. H. (2001). *Money: understanding and creating alternatives to legal tender*. White River Junction, Vt: Chelsea Green Pub.

Hogan, T. L. (2012). Competition in Currency. *Policy Analysis*, *698*, 1–53.

Kohli, U., & Rich, G. (1985). Monetary control: the Swiss experience. *Cato J.*, *5*, 911.

Krohn, G. A., & Snyder, A. M. (2008). An Economic Analysis of Contemporary Local Currencies in the United States. *International Journal of Community Currency Research*, *12*(1), 53–68.

McCormick, L. C. (2011). Swiss Swap Rates Turn Negative Amid SNB's Franc Struggle: Chart of the Day - Bloomberg. Retrieved December 28, 2014, from http://www.bloomberg.com/news/2011-08-17/swiss-swap-rates-turn-negative-amid-snb-s-franc-fight-chart-of-the-day.html

Olivei, G. P. (2002). Switzerland'sapproach to monetary policy. *New England Economic Review*, 57–60.

Statistik Schweiz - Bundesamtfür Statistik. (n.d.). Retrieved December 28, 2014, from http://www.bfs.admin.ch/

Stodder, J. (2009). Complementary credit networks and macroeconomic stability: Switzerland's< i>Wirtschaftsring</i>. *Journal of Economic Behavior & Organization*, *72*(1), 79–95.

WIR-Bank, 2005b. Rapport de Gestion, Various Years, Basle: WIR

Yildirim, J. (2003). Currency substitution and the demand for money in five European Union Countries. *Journal of Applied Economics*, *6*(2), 361–383.

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