

IMPACT OF MANAGED DEPRECIATIONS ON FINANCIAL MARKETS

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Dopad riadených depreciácií na finančné trhy.

Abstract: *The impact of expansionary monetary policy on financial markets had previously been investigated in numerous studies – however, these studies mostly focused on the effects of the policy of Quantitative Easing (QE). Consequently, in this paper we investigate the financial market effects of another expansionary monetary policy instrument – managed depreciation followed by the introduction of one-sided exchange rate commitment that was implemented by the Czech and Swiss central banks after the Global Financial Crisis of 2008-2009 (GFC). Specifically, we analyze the impact of this instrument on two main segments of the financial market – bonds and stock markets – in both the Czech Republic and Switzerland. Using a fully modified OLS (FMOLS) estimator, we study the effects of FX interventions and exchange rate movements on bond yields and stock prices. We do find some evidence that the implementation of this policy contributes to lower bond yields and higher stock prices. Central bank foreign currency purchases have decreased bond yields in the Czech Republic, while they had a positive impact on stock prices in Switzerland. Furthermore, we also found that currency depreciation seems to be associated with higher bond yields, while we do not find evidence that the exchange rate movements had an impact on stock market in either country.*

Keywords: *exchange rate commitment, managed depreciation, FX interventions, FMOLS estimator*

JEL Classification: E44, E58, F31

1. Introduction

The ultra-loose monetary policy stance of central banks in major advanced economies, which followed the Global Financial Crisis (GFC), has been associated with a fall of interest rates towards historically low levels, which

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may have contributed to a long-lasting rally at the major stock markets around the globe. This is because the environment of low interest rates stimulates the investors in search of higher yields to turn to riskier financial instruments, such as equities, leading to growth of their prices [9]. As a result, episodes of loose monetary policy often lead to overvalued stock prices. Quantitative easing (QE) was the main unconventional monetary policy instrument used by the central banks of some of the largest advanced economies in the post-GFC era. This policy of massive asset purchases – of especially governmental bonds, was indeed associated with declining bond yields, a situation, which normally leads to a stock market rally. Indeed, for example, between the introduction of the QE by the FED in November 2008 and its final termination in October 2014, the 10-year U.S. sovereign bond yields decreased from 3.53% to just 2.30% while the S&P 500 equities index increased by roughly 130% over the same period. QE was, however, not the only policy instrument that central banks introduced in order to tackle the post-GFC stagnation. Managed depreciation of a domestic currency can be included among other expansionary monetary policy tools used in the post-GFC era. This policy was introduced most notably in Switzerland and in the Czech Republic in 2011 and 2013, respectively. On 6 September 2011 facing significant appreciation pressures and risk of deflation, the Swiss National Bank (SNB) announced the introduction of a minimum exchange rate of 1.20 Swiss francs to Euro – initially the SNB weakened Swiss franc to the level of 1.20 CHF/EUR and committed itself to prevent any appreciation of Swiss franc beyond this rate. Until its abrupt discontinuation on 15 January 2015, the minimum exchange rate served as the main instrument of SNB's monetary policy. On 7 November 2013 the Czech National Bank (CNB) adopted an asymmetric (or one-sided) exchange rate commitment of 27 Czech koruna to Euro as an additional tool for easing of monetary conditions – at first the CNB weakened koruna to the level of 27 CZK/EUR, and it then pledged to keep the CZK/EUR exchange rate close to this level. In practice the CNB allowed the exchange rate to float freely above the rate of 27 CZK/EUR and intervened only to prevent appreciation below this rate. The CNB discontinued its one-sided exchange rate commitment on 6 April 2017. When necessary, the exchange rate commitments³ of both the CNB and the SNB were defended by foreign exchange (FX) interventions, which led to a massive accumulation of FX reserves. The impact of this policy on the financial markets is less clear. Consequently, this paper aims to fill the gap in the literature and analyze the impact of the policy of managed depreciation followed by the introduction of

³ Though the minimum exchange rate implemented by the SNB and the one-sided exchange rate commitment implemented by the CNB were technically not the same policy, for the purpose of this paper, however, these technical differences are of no major importance, and so we use these terms interchangeably throughout the paper.

one-sided exchange rate commitment on two of the most important financial market segments – the bonds and stock markets in the Czech Republic and in Switzerland. In our empirical analysis, we use the volume of FX interventions and the exchange rate movements as our proxies for the policy of managed depreciation followed by the introduction of one-sided exchange rate commitment.

The next section of this paper provides some theoretical background on the relationship between the exchange rate, the foreign exchange interventions, and the financial markets. The third section reviews related literature, while fourth section is dedicated to the econometric analysis, whereas the fifth section concludes the paper.

2. Theoretical Framework

In order to study the effect of the policy of managed depreciation followed by introduction of one-sided exchange rate commitment on financial markets, we use both the FX interventions and the exchange rate as a measure representing the effects of this policy instrument. In this section, we therefore focus on the theoretical basis for the effect of exchange rate movements and FX interventions on bond yields and stock prices, respectively. The attention of the theoretical literature has so far mostly been focused on the impact of bond yields on exchange rate, i.e. the opposite relationship to the one we analyze in this paper. As expansionary monetary policy reduces the average interest rates and thus pushes the bond yields downwards, in this study we instead aim to investigate the impact of the exchange rate movements on bond yields in both countries – as the weaker exchange rate was used as a tool of further policy easing by both the CNB and SNB. As bond yields themselves consist of several components, it is important to understand which of these components may be affected by the exchange rate movements. Textbooks often consider various components of bond yields: real rate, inflation premium (or expected inflation), term premium and risk premium. Here exchange rate influences the inflation premium because exchange rate depreciation leads to higher inflation and it thus pushes the inflation premium upwards. If depreciation was associated with worsening economic environment, the risk premium may increase as a result. Consequently, based on this decomposition, weaker currency may theoretically be linked with higher bond yields and stronger currency with lower yields. Though theoretical literature only seldom considers the direct effect of exchange rate on bond yields, the authors usually come to similar conclusions. An example is Chovancova et al. [5], who believed that expectations of exchange rate influence the government bond yields – when exchange rate is expected to depreciate, the government bond yields will rise. Gagnon [8] summarized three mechanisms through which significant

exchange rate depreciation leads to higher bond yields – because of resulting higher inflation expectations, the investors will expect higher nominal yields as a compensation for higher inflation. Additionally, higher inflation may lead to expectations that the central bank will increase policy rates, which will further increase bond yields. And finally, significant episodes of currency depreciation may lead to higher uncertainty about key macroeconomic variables and thus lead to higher risk premium. However, in the case of asymmetric exchange rate commitments, we may assume that the risk premium may in fact decrease – given the higher certainty about the future exchange rate movements (as long as the commitment remains credible, of course).

Furthermore, in the case of asymmetric exchange commitments, the Swiss franc and Czech koruna were first weakened, and then the one-sided exchange rate commitments were defended by central bank FX interventions. As a result, it can be argued that in this case, the exchange rate depreciation may not be expected to cause an overall increase in bond yields, but it may rather be expected to lead to lower bond yields. When a central bank conducts an FX intervention with an aim of weakening the domestic currency, it purchases foreign currency and sells domestic currency, thus increasing domestic monetary base. If the central bank allows this change of monetary base, the intervention is called non-sterilized, if the central bank decides to prevent the increase of monetary base, the intervention is said to be sterilized. Consequently, a non-sterilized intervention, as an increase of money supply, is likely to lead to lower bond yields and by extension to higher stock prices.⁴ For sterilized interventions, no change of interest rates would be expected and their impact on bond yields or stock prices is therefore rather ambiguous. However, Garcia [10] concluded that even sterilized interventions are expansionary. He argues that sterilized interventions lead to an increase of commercial banks' balance sheets – the bonds issued by the central bank with an aim of sterilizing the interventions being part of assets of the commercial banks. As sterilization prevents a change of interest rate, which is the main determinant of the return on bonds, the rather low-yielding bonds now make up a substantial part of commercial banks' assets. As a result, the commercial banks would then prefer to lower their bond holdings and instead increase the amount of their outstanding loans, which are more profitable. Accordingly, they would start selling the bonds and thus drive the bond yields higher, which would force the central bank to increase the money supply in order to prevent the increase of interest rates.⁵ Higher money supply provided by the central

⁴ On the other hand, the increase of money supply may eventually lead to higher inflation, which in turn normally results in higher nominal bond yields over the long-term.

⁵ If a central bank intervenes against the domestic currency, it will also be interested in preventing the increase of interest rates – higher interest rates normally lead to appreciation of domestic currency.

bank would then enable the commercial banks to increase the amount of loans they provide and thus even a sterilized intervention could be expansionary and in the end lead to increased supply of money.

There is no clear agreement in neither the theoretical nor in empirical literature on what the relationship between the exchange rate and the stock market is. For example, Aggarwal [1] believed that in the long-run, currency depreciation should lead to an increase in stock prices – as depreciation would support domestic economic growth and hence lead to a growth of stock prices, as stocks would get cheaper and more attractive for foreigners who would then buy more domestic stocks leading to rising stock prices. However, he believed that in the short-run, depreciation of domestic currency would negatively affect domestic economy – as the costs of imported goods would rise, leading to an economic slowdown, which would contribute to a temporary decline of stock prices. On the other hand, a positive short-run relationship between the Pound Sterling's depreciation and UK's FTSE 100 stock market index in the recent years has been explained by the large proportion of multinational corporations in this index – as the domestic currency weakens, the profits generated abroad are worth more expressed in domestic currency, thus boosting the stock prices as well [4]. On the other hand, Bahmani-Oskooee and Sohrabian [2] argued that it is not only the exchange rate that affects the stock prices but that also the stock market influences the exchange rate. They argued that an increase in domestic stock prices increases the domestic wealth, which in turn leads to higher demand for money and higher interest rates. Higher interest rates attract foreign investors to invest more in domestic economy and this leads to appreciation of domestic currency. The former effect is usually referred to as international trading effect, while the latter effect is referred to as portfolio balance effect.

FX interventions against domestic currency, especially non-sterilized interventions, as an increase in domestic monetary base and ultimately money supply can be expected to lead to lower interest rates and subsequently to higher stock prices. For example, Sellin [19] believed that since the value of a stock is the sum of present value of future dividend earnings, an increase in money supply and associated decrease in interest rates leads to revaluation of the stock prices. Lower interest rates mean that the discounted value of future dividend earnings is higher and thus the stock price increases. Additionally, lower interest rates that are initially caused by higher money supply also lead to higher risk appetite of investors. Investors then search for riskier assets that may generate higher returns and so they turn to the stock market and thus contribute to higher stock prices. In the literature, this phenomenon of higher appetite for risk taking is often referred to as reaching for yield [16]. In this

context, some studies, for example Borio and Zhu [3], proposed a risk-taking channel of monetary policy.

3. Literature Review

Numerous studies have previously focused on determinants of bond yields,⁶ although the exchange rate is usually not found to be among the key drivers of bond yields. One of the studies, which analyzed the determinants of bond yields and included the exchange rate among them, was Rodionova [18], who investigated the main factors influencing the Russian government bond yields during the years 2003-2009. This study found that a depreciation of Russian ruble by 1% caused the government bond yields to grow by 0.12%. The effect of exchange rate on bond yields was found to be more significant for bonds with shorter maturity than for bonds with longer maturity. Hsing [14] also found that between the year of 1999 and 2014 a depreciation of the Euro against the U.S. dollar would lead to higher Spanish government bond yields – as investors would buy less Spanish bonds, driving yields higher. These two studies found support for the standard theoretical assumption that currency depreciation leads to higher bond yields – in these cases, the currency depreciation increases perceived riskiness of domestic bonds, and thus both domestic and foreign investors prefer investing abroad. This is especially the case for riskier emerging economies. Their findings are the exact opposite of our assumption that when the weakness of the domestic currency is induced by the central bank (and not by fundamental factors or uncertainty) the bond yields may be expected to fall. Additionally, many papers analyze the impact of exchange rate risk or higher exchange rate volatility on bond yields – higher exchange rate volatility is expected to drive up the bond yields, for example Gadanez et al. [7] did confirm this assumption when they found that the exchange rate volatility did lead to higher local currency bond yields for a panel of emerging market economies between 2005 and 2013. Literature focused on the impact of currency interventions on *domestic* bond yields is rather scarce. An example is Gerlach-Kristen et al. [12] who investigated the impact of Japan's FX interventions on sovereign bond yields and they found that these interventions not only lowered bond yields abroad, but they also lowered Japanese sovereign bonds as well – a trillion Yen intervention lowered Japanese sovereign bond yields by approximately 3.5 basis points based on the data of the BOJ interventions in 2003/04. An earlier study by Gerlach et al. [11] analyzed the effects of Swiss interventions in 2009-2010 on bond yields. They found that SNB's currency interventions did decrease the Swiss government bond yields by 1.5-2.8 basis points depending on model specification.

⁶ Primarily represented by sovereign bond yields.

The studies that evaluated the relationship between the exchange rates and stock market often come to conflicting conclusions – depending on time period or on countries being analyzed. One of the early studies that studied the relationship between the exchange rate and stock market was Aggarwal [1], who analyzed the impact of movements of U.S. dollar effective exchange rate on U.S. stock market in 1974-1978 and concluded that there existed a positive relationship – a depreciation of the dollar was correlated with a decline of stock indices in the short-run. Bahmani-Oskoee and Sohrabian [2] later identified a dual causal relationship between the stock prices and effective exchange rate of the U.S. dollar in the short-run; however, they did not find a long-run relationship between these variables. On the other hand, Kim [15] found that there existed a long-run relationship between the real exchange rate of U.S. dollar and U.S. stock market – real currency depreciation was associated with higher stock prices based on the analysis spanning the time period between the years 1974 and 1998. Nevertheless, Dimitrova [6] found that in the period from 1990 until 2004, the exchange rate depreciation led to a decrease of stock prices in the United States. Tsai [20] believed that these conflicting findings of various studies could be explained by the fact that portfolio balance effect does not always exist and hence the relationship between the exchange rate and stock market is normally dictated by the international trading effect – only under some special circumstances would the portfolio balance effect appear. For example, if the domestic stock market was performing comparatively well, foreign funds would flow into domestic economy thus contributing to stronger domestic currency. Employing quantile regression approach on data from six countries in Eastern and Southern Asia from 1992-2009, the empirical findings of that study did support those assumptions. Studies investigating the relationship between the exchange rate and stock market in the case of the Czech Republic or Switzerland are very rare. An exception is Hsing [13], who investigated what factors affect stock market developments in the Czech Republic and found that depreciation of Czech koruna by 1% led between the years 2002 and 2010 to a decrease of the Czech stock market by slightly less than 0.5%. Vejmelek [21] examined the impact of CNB's FX interventions that followed the introduction of the exchange rate commitment on Czech financial markets and he found no significant impact on the stock market – this insignificant relationship was explained by small size of Czech stock market – the overall market capitalization amounted to less than 20% of GDP. The CNB's FX interventions were, however, believed to have contributed to declining bond yields.

4. Estimating the Effects of Exchange Rate Commitments

In this subsection we conduct a simple empirical exercise in order to analyze the effect of introduction of exchange rate commitments of CNB and

SNB on the respective countries' financial markets. In order to do so, we investigate the effect of the foreign currency purchases and/or exchange rate movements on the bond yields or on the stock market prices.

4.1. Data

We perform our analysis on monthly data for the period when the asymmetric exchange rate commitments were in place – from September 2011 until January 2015 and from November 2013 until April 2017 in the case of Switzerland and the Czech Republic, respectively.⁷ As our measure of exchange rate, we use the exchange rate of the respective domestic currencies to Euro.⁸ We opted for this measure, as the trade with the Euro Area accounts for the majority of foreign trade of both countries. The bond yields are represented by the yields of ten-year Czech and Swiss government bonds. In selecting this maturity, we followed the approach taken by other papers – as the long-term bond yields are more sensitive to current market developments. The stock prices are represented by PX Index and Swiss Market Index in the case of the Czech Republic and Switzerland, respectively. While the CNB does publish its volume of FX interventions on a monthly basis, the SNB does not do so. Consequently, we opted to use the volume of FX reserves expressed in domestic currency as a proxy for FX interventions. However, this measure is also affected by changes in the exchange rate of the domestic currency, as well as the returns on central bank's foreign assets. Nevertheless, as the exchange rate changes during the period of exchange rate implementation were not very significant and both central banks mostly hold their FX reserves in rather low-yielding advanced economies' sovereign bonds, we assume that the effect of these changes on FX reserves was likely insignificant and as a result, the changes in FX reserves during the analyzed period mostly reflected the FX interventions. For detailed description of the data, as well as the sources, please refer to Appendix A.

4.2. Methodology

In order to test, whether the implementation of the policy of managed depreciation lowered bond yields, we simply regress the ten-year government bond yield on FX reserves and/or exchange rates. As all our variables are non-stationary at levels, we estimate the equations (1) and (2) with FMOLS

⁷ Obviously, the analysis is performed on a different time period for each country – however, our main point of interest is not necessarily the comparison of the results between the two countries, but the analysis of the effect of this unconventional policy instrument on the financial markets in general. As we only have two countries in our sample, we opted for an individual analysis for each country instead of a panel analysis.

⁸ Exchange rate is in direct quotation, i.e. an increase in the value of exchange rate means currency depreciation.

cointegrating estimator as first proposed by Phillips and Hansen [17]. This estimator uses semi-parametric correction to eliminate the issues caused by the long-run correlation between the cointegrating equation and stochastic regression innovations. As the variables included into a FMOLS model must be non-stationary and cointegrated, we use the Augmented Dickey-Fuller (ADF) Test as our preferred test of stationarity and the Johansen Cointegration Test as our preferred test of cointegration. To save space, we do not report the results of these tests in this paper and they are available from authors upon request.

$$\text{Yield}_t = \beta_0 + \beta_1 \text{FX Reserves}_t + \beta_2 X_t + \varepsilon_t \quad (1)$$

where *Yield* represents the yield on 10-year sovereign bonds, while the *FX Reserves* represents the log of the volume of central bank FX reserves expressed in domestic currency. X_t is the vector of control variables.

$$\text{Yield}_t = \beta_0 + \beta_1 ER_t + \beta_2 X_t + \varepsilon_t \quad (2)$$

where *ER* represents the absolute value of exchange rate of domestic currency to Euro. We estimate both the equations (1) and (2) individually for both the Czech Republic and Switzerland. Afterwards, we proceed with the analysis of the impact of CNB's and SNB's exchange rate floors on stock markets in the respective countries. In order to do so, we simply regress the value each countries' main stock market index on FX reserves and/or the exchange rate – equations (3) and (4).

$$\text{Index}_t = \beta_0 + \beta_1 \text{FX Reserves}_t + \beta_2 X_t + \varepsilon_t \quad (3)$$

$$\text{Index}_t = \beta_0 + \beta_1 ER_t + \beta_2 X_t + \varepsilon_t \quad (4)$$

where *Index* represents the value of the stock market index expressed in logarithm.

4.3. Results

Table 1 and Table 2 summarize key findings with regards to the impact of exchange rate and foreign currency interventions on the government bond yields in the Czech Republic and in Switzerland, respectively. The first two model specifications represent the coefficients from the equations (1) and (2). Furthermore, in the next two model specifications, we include additional variables to control for other factors that might have affected the bond yields. These include a measure of economic output, as well as a measure financial market risk represented by Financial Stress Index.⁹ Finally, in the

⁹ We eventually decided not to include interbank interest rate among the explanatory va-

last model specification, we include both the FX reserves and exchange rate as explanatory variables.

Table 1

The impact of exchange rate and foreign currency interventions on 10-year Swiss sovereign bond yields¹⁰

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Bond yields				
FX Reserves	-0.002		0.000		0.002
	(0.003)		(0.003)		(0.002)
Exchange Rate		0.070***		0.065***	0.066***
		(0.017)		(0.008)	(0.007)
Output			-0.000	0.000	-0.000
			(0.000)	(0.000)	(0.000)
Financial Stress			0.002	0.002***	0.003***
			(0.002)	(0.001)	(0.001)
Constant	0.036	-0.077***	0.013	-0.069***	-0.098***
	(0.034)	(0.021)	(0.035)	(0.013)	(0.023)
Observations	41	41	41	41	41
R-squared	0.035	0.229	0.101	0.713	0.707

Source: author's calculations

We find that the FX interventions do seem to have had a negative impact on the bond yields during the analyzed period only in the Czech Republic – confirming our initial hypothesis that the related increase in money supply would reduce the yields. However, we do not find any such effect in Switzerland, which is not so surprising given the fact that Swiss sovereign bond market is relatively small and thus, the investors might have preferred other alternative investment opportunities to invest the additional franc liquidity injected into the economy by the SNB's interventions. On the other hand, for the exchange rate we do find a positive coefficient in both countries, indicating that the currency depreciation increases bond yields – suggesting that the weaker currency was associated with higher risk and inflation premiums even during the time of the one-sided exchange rate commitment implementation.

riables, as in the case of the Czech Republic, this variable had a very high negative correlation with the variable FX Reserves. Thus, in order to use the same model for both countries, we did not include this important determinant in either model.

¹⁰ Standard errors are in parentheses: * denotes 10 percent significance level, ** denotes 5 percent significance level, *** denotes 1 percent significance level

Table 2

The impact of exchange rate and foreign currency interventions on 10-year Czech sovereign bond yields

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Bond yields	Bond yields	Bond yields	Bond yields	Bond yields
FX Reserves	-0.015** (0.007)		-0.012*** (0.003)		-0.014*** (0.003)
Exchange Rate		0.011** (0.005)		0.009** (0.004)	-0.010*** (0.003)
Output			0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Financial Stress			-0.011*** (0.004)	-0.009** (0.004)	-0.016*** (0.003)
Constant	0.226** (0.095)	-0.283** (0.140)	0.156*** (0.050)	-0.261*** (0.100)	0.448*** (0.125)
Observations	42	42	42	42	42
R-squared	0.284	0.097	0.202	0.011	0.192

Source: author's calculations

Table 3 presents the results of our econometric analysis of the effect of FX interventions and exchange rate on the Czech and Swiss stock markets. To save space, we only report model specifications with all the explanatory variables for both countries. Not surprisingly, we do not find any positive effect of exchange rate on stock market in the Czech Republic, where the stock market is much less developed. Surprisingly, we even find a small negative impact of FX interventions. This can be attributed to the limited size of the Czech stock market. The ratio of stock market capitalization to GDP in Czechia is indeed one of the lowest in the EU and only a limited number of companies are traded on the stock market – as most large companies are foreign-owned and therefore not traded on Prague stock exchange.

Table 3

The impact of exchange rate and foreign currency interventions on Czech and Swiss stock markets

	(1)	(2)
VARIABLES	Czech Republic	Switzerland
FX Reserves	-0.086*** (0.025)	0.289*** (0.068)
Exchange Rate	-0.048 (0.035)	0.210 (0.319)
Output	-0.000	0.007***

	(0.001)	(0.002)
Financial Stress	-0.140***	-0.174***
	(0.027)	(0.048)
Constant	9.285***	4.082***
	(1.237)	(0.988)
Observations	42	41
R-squared	0.259	0.452

Source: author's calculations

For Switzerland, we do find a statistically significant and positive effect of SNB's interventions on Swiss stock market – which is in line with our expectations – as investors invested the additional Swiss franc liquidity injected by the SNB's interventions into the Swiss stock market. Indeed, the highly developed Swiss stock market offered investors more investment opportunities than the Czech stock market – explaining the different results we found for these two countries. Furthermore, we do not find any statistically significant effect of exchange rate movements on stock market in either country. This result is somewhat surprising in the Swiss case, as large Swiss companies derive large proportion of their earnings from abroad and thus one might have expected a currency appreciation, which reduces competitiveness of Swiss companies and decreases the franc value of their foreign earnings, to negatively affect the value of their stocks. Nevertheless, the analyzed period had been characterized by increased uncertainty – especially in the Euro Area. Consequently, Switzerland, with its reputation as a safe haven, attracted huge inflows of capital (which was the primary reason for franc's strength). As a result, our results tentatively suggest that the investors' trust in Swiss economy and companies wasn't affected by franc's exchange rate and thus the franc strength did not affect the Swiss stock market negatively.

5. Conclusions and Policy Implications

In this study, we analyzed the impact of a policy of managed depreciation followed by the introduction of one-sided exchange rate commitments in the Czech Republic and in Switzerland on the financial markets in these two countries. The period when this expansionary monetary policy instrument was implemented was associated with a gradual decrease of government bond yields and in the case of Switzerland also with steeply rising stock prices. The econometric analysis confirmed that even sterilized CNB's FX interventions did have a negative effect on bond yields in the Czech Republic – with non-sterilized interventions of the SNB having no such effect on Swiss sovereign bond yields – owing probably to the relatively limited size of this market in Switzerland. For Switzerland we did, however, find a positive relationship

between the franc exchange rate and the bond yields. We also found a strong positive effect of FX interventions on the Swiss stock market – the Czech stock market does not seem to have been affected significantly by either the FX interventions, or the exchange rate movements. The main conclusion stemming from our analysis is therefore that the FX interventions against domestic currency and thus the policy of managed depreciation might have expansionary effect on financial markets – they may decrease bond yields and increase stock prices. Consequently, central banks, most likely the central banks of small and open economies, which might be considering using a managed depreciation as an expansionary monetary policy tool, may assume that the transmission of this policy into the real economy may also occur through the financial markets. By lowering the bond yields, the FX interventions conducted in order to weaken the domestic currency (or prevent its appreciation), can make the external financing cheaper for economic agents, while higher stock prices may operate through the wealth channel and increase domestic consumption. Nevertheless, by contributing to higher stock prices, this policy might also potentially lead to stock market bubbles and thus, even the central banks that use managed depreciations must be aware of this potential threat to financial stability in the future.

Acknowledgement

The authors acknowledge that this paper is the partial result of the project VEGA (1/0613/18) *Deepening of Economic Inequalities as a Consequence of Distributional Effects of Unconventional Monetary Policy*. We thank Maria Siranova and participants of the 22nd EDAMBA conference for their helpful comments and suggestions.

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Appendix A:

Data description and sources

Variable	Country	Description	Source
Exchange Rate	Czech Republic	CZK to EUR Exchange Rate	Czech National Bank
Exchange Rate	Switzerland	CHF to EUR Exchange Rate	Swiss National Bank
Bond Yield	Czech Republic	10-year government bond yields	Czech National Bank
Bond Yield	Switzerland	10-year government bond yields	Swiss National Bank
FX Reserves	Czech Republic	Foreign Currency Reserves	Czech National Bank
FX Reserves	Switzerland	Foreign Currency Reserves	Swiss National Bank
Output	Czech Republic	Industrial Production Index	Czech National Bank
Output	Switzerland	Linearly extrapolated Manufacturing Index	Swiss National Bank
Stock Price	Czech Republic	PX Index	Prague Stock Exchange
Stock Price	Switzerland	Swiss Market Index	Swiss National Bank
Financial Stress	International	St. Louis Fed Financial Stress Index	St. Louis Fed