DOCUMENTOS DE POLÍTICA ECONÓMICA

Tasas de Interés de Largo Plazo en Economías Desarrolladas: Tendencias Recientes e Implicancias de Política Monetaria en Chile.

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N.º 52 Enero 2015

BANCO CENTRAL DE CHILE

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Documentos de Política Económica del Banco Central de Chile
Economic Policy Papers of the Central Bank of Chile
ISSN 0717-7151

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Resumen

Este artículo estudia la evolución reciente de las tasas de interés de largo plazo en países desarrollados. El análisis muestra que, tanto las expectativas de tasas futuras, como el premio por plazo exigido por los inversionistas para invertir en bonos de larga duración, son factores importantes para explicar los bajos niveles de tasas de interés observados después de la crisis subprime. El estudio también analiza la posible evolución futura de las tasas de interés en un marco de normalización de tasas, así como escenarios de riesgo asociados a este proceso. Finalmente, presentamos evidencia acerca de la relación histórica entre las tasas de interés de Estados Unidos y Chile, y discutimos sus implicancias para el manejo de la política monetaria.

Long-term Interest Rates in Advanced Economies: Recent Trends and Implications for Monetary Policy in Chile

Summary

This document discusses recent trends in long-term interest rates in advanced economies. We argue that expectations of future short-term rates, as well as the term premium required by investors for holding long-term bonds, seem to be important for explaining the historically low levels of interest rates observed after the subprime crisis. We also discuss what the future might bring in terms of interest rate normalization, including some of the risks involved in the process. Finally, we present evidence about the link between interest rates in Chile and the United States, and analyze its implications for monetary policy.

1. Introduction

Long-term interest rates in advanced economies have been close to their historical minimums after the subprime crisis. At first glance, this behavior seems intuitive given the exceptionally loose monetary policy stances. Indeed, with conventional monetary policy at virtually zero rates, countries such as the US, the UK, and Japan have pursued further *unconventional* measures. These include the large-scale asset purchase programs (LSAP) or *quantitative easing* (QE), and a bolder and more explicit language about how these rates were likely to be maintained in the medium term, also known as *forward guidance*.

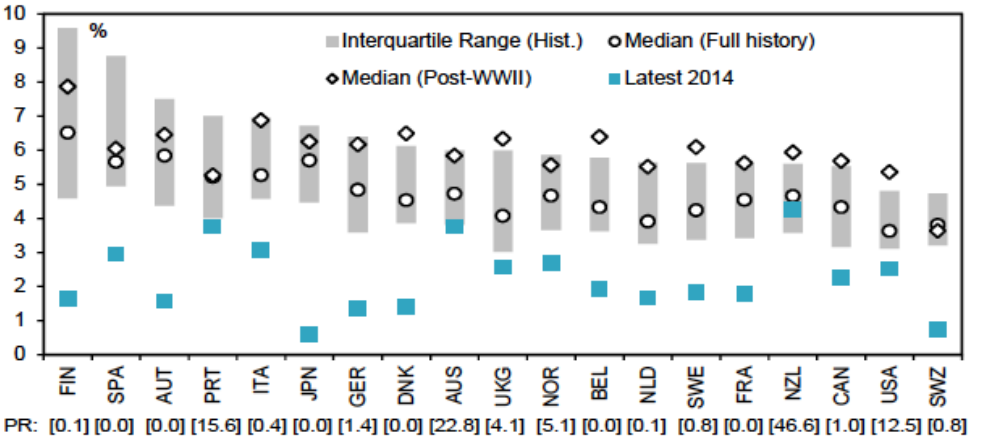
As lead indicators of economic activity in the US and UK begin to show more consistent symptoms of recovery, a natural question that arises is what will happen to interest rates—not only short-term policy rates, but also longer-term rates, which are of key importance for consumption and investment decisions in the real economy. In this document, we pursue the following tasks. First, we review recent evidence that provides a more systematic answer for why long-term interest rates have been so low in recent years. Here, we argue that both the expectations of future short-term rates, as well as the term premium required by investors for holding long-term bonds, seem to be important for explaining the recent past. Second, and in light of the likely change in the direction of monetary policy in key advanced economies, we wonder what the near future may bring in terms of interest rate normalization, including some of the risks involved in the process.

Thirdly, we present some evidence of the link between interest rates in Chile—both short- and long-term—and the corresponding rates in the US. Based on this exercise, we discuss the transmission of long-term interest rate changes in the US to Chile, and discuss the implications for monetary policy.

II. Why are long-term interest rates so low?

Figure 1 reproduces statistics provided by Goldman Sachs about nominal long-term rates in industrialized economies.[1] The study provides a historical perspective, with some of the series going as far back as 1870**.** The gray bars give the interquartile range of the distribution of long-term rates (mostly 10-year yields), while the white dots and squares provide sample means for different time periods. The blue squares give the current levels of long yields (as of May 2014), and the brackets below each country give their percentile rank.

Figure 1: Long-term perspective on long-term yields



Source: Barro-Ursua Dataset, GFD, Goldman Sachs Global Investment Research.

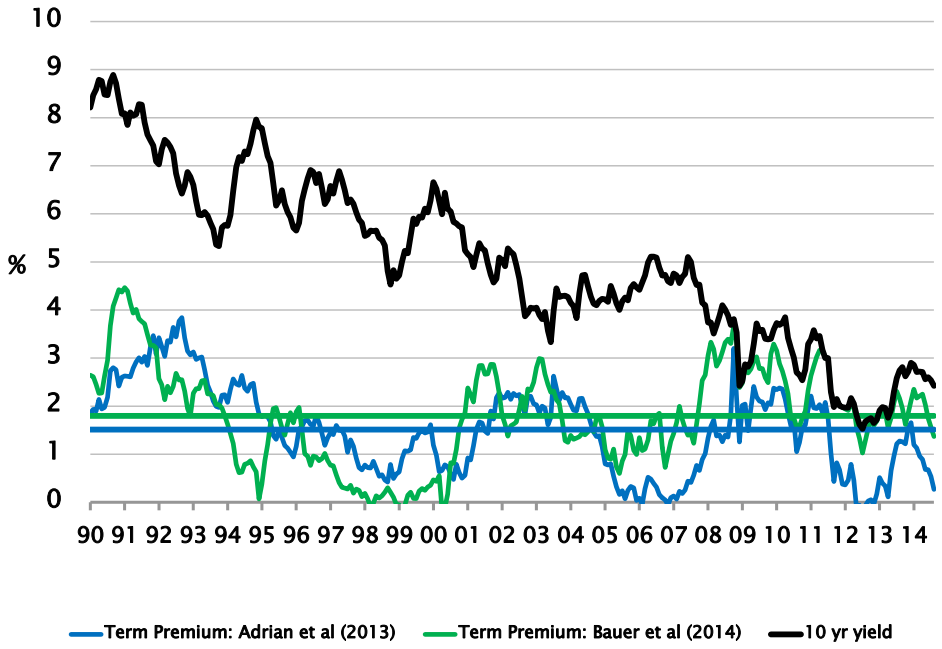
The main conclusion from this figure is that rates are low from a historical point of view. In fact, in a few countries they are as low as they have ever been (that is, a percentile rank of 0.0), and in most they are in the bottom decile of the distribution (percentile rank below 10.0).

To understand why rates are so low, one must first understand that the long-term interest rate implicit in, say, 10-year US government bonds is composed of two main determinants. The first is the expected evolution of short-term interest rates, or the

[1] Goldman Sachs Global Economics Weekly, issue No. 14/19.

neutral rate: if investors expect short-term rates to be higher in the future, a long-term bond will incorporate these expectations through a higher rate of discount. The second determinant is associated with risk—not default risk, which is negligible for such bonds, but price risk. Because long-term bond prices are more sensitive to changes in discount rates, investors require extra compensation for purchasing them. This second component, the risk or *term* premium, is positively related to the risks associated with the evolution of short-term rates.

Figure 2: Decomposing US long-term rates



Recent academic studies seek to systematically decompose long-term rates into a neutral rate and a term premium component. Because different researchers have proposed different methodologies, there is no unique way to perform this decomposition.[2] Figure 2 plots the evolution of 10-year rates for the US since 1990, as well as estimates of the term premium component using the methodologies

[2] See Ang and Piazzesi (2003); Wright (2011); Adrian et al. (2013); Joslin et al. (2014); Bauer et al. (2014).

proposed by Adrian et al. (2013), and Bauer et al. (2014).[3] While under both series the recent estimate of the term premium (as of August 2014) is below its average since 1990, it is significantly lower according to Adrian et al. (2013). Other studies using alternative methodologies similarly conclude that the term premium is significantly compressed relative to historical data. Indeed, using the methodology in D'Amico et al. (2010) with recent data, an even negative estimate of the current term premium in 10-year yields is obtained.

So, why are rates so low? In a speech delivered in March 2013, former chairman of the Federal Reserve Ben Bernanke pointed to a variety of factors based on the study of D'Amico et al. (2010). Factors that lower the neutral rate include a reduction in expected short-term real rates due to sluggish economic growth, and a marked drop in the trend of inflation levels. Regarding the term premium, a drop in inflation volatility—one of the main risks for bondholders in the 1970s and '80s—seemed to provide a further argument.

Significantly, the large-scale asset purchase programs or QE pursued aggressively by the Fed as part of its unconventional measures also seem to be important. Recent estimates suggest that the cumulative effects of QE 1 and QE 2, which involved purchases of nearly 1 USD Tr of long-term treasuries, reduced 10-year yields by about 100 basis points (bp).[4] Joyce et al. (2011) find a similar effect for LSAP programs by the Bank of England (BoE) on 10-year gilts. These studies attribute most of the drop in yields to a reduction in the term premium, as the impact on market-implied measures of the neutral rate was small around these announcements.

Naturally, the effects of QE are likely to spread to other fixed-income markets. Indeed, Krishnamurthy and Vissing-Jorgensen (2011) estimate that QE 1 and 2 also

[3] The current estimates using the methodology of Bauer et al. (2014) were calculated by staff at the Central Bank of Chile, with data up to August 2014. Adrian et al. update their series daily, available at http://www.newyorkfed.org/research/data_indicators/term_premia.html.
[4] See Krishnamurthy and Vissing-Jorgensen (2011); Gagnon et al. (2011); D'Amico et al. (2012).

lowered long-term corporate bond yields between 80 and 100 bp, depending on the specific rating category. Table 1 reproduces estimates reported in this study, including the cumulative effect of QE announcements on directly targeted assets (panel a), and corporate yields (panel b), which were not purchased directly by the Fed but benefited from QE nonetheless (through portfolio effects of investors in fixed-income markets).

Table 1: Impact of LSAP announcements on fixed-income markets

a) Targeted markets

Two-day changes (in basis points)

Date	Event	Treasuries yields (constant maturity)					Agency yields				Agency MBS yields	
		30 year	10 year	5 year	3 year	1 year	30 year	10 year	5 year	3 year	30 year	15 year
11/25/2008	Initial announce- ment	-24	-36	-23	-15	-2	-57	-76	-57	-42	-72	-88
12/1/2008	Bernanke speech	-27	-25	-28	-15	-13	-52	-67	-50	-33	-14	12
12/16/2008	FOMC statement	-32	-33	-15	-4	-5	-37	-39	-26	-25	-26	-16
1/28/2009	FOMC statement	31	28	28	19	4	33	28	27	14	31	20
3/18/2009	FOMC statement	-21	-41	-36	-24	-9	-31	-45	-44	-35	-27	-16
Above 5 dates	Above 5 events	-73*	-107**	-74	-39	-25**	-144**	-200***	-150***	-123***	-107*	-88

b) Non-targeted markets

Two-day changes (in basis points)

Corporate Yields	Aaa long	Aa long	A long	Baa long	Ba long	B long	Aaa int	Aa int	A int	Baa int	Ba int	B int
11/25/2008	-28	-18	-23	-19	-4	4	-17	-15	-18	-18	1	-47
12/1/2008	-24	-24	-21	-17	-13	28	-21	-15	-18	-8	-5	6
12/16/2008	-43	-37	-45	-39	1	-11	-19	-21	-24	-27	-28	-42
1/28/2009	34	17	17	14	-16	-25	12	8	7	3	-32	-25
3/18/2009	-16	-21	-21	-20	-28	-39	-43	-50	-39	-26	-18	-22
Above 5 dates	-77	-83**	-93**	-81**	-60**	-43	-88**	-93**	-92**	-76**	-82***	-130***

Summing up, while there is some disagreement about the exact decomposition of long-term interest rates, most studies for the US suggest that compression of term premia explains a large portion of this trend. Why exactly is term premia compressed remains open for debate, but recent empirical work robustly finds an important role for the Fed's LSAP programs. Moreover, the reduction of interest

rates in the US seems to have increased risk taking into other fixed-income categories, such as corporate bonds.

III. Normalization of long-term rates: baseline and risk scenarios

Given the record lows for interest rates in recent years, and the exceptionally loose monetary environment that has given rise to them, it is only natural to expect a reversal in the medium term. For sure, certain aspects of the trend in lower rates are likely to be more permanent, such as lower average inflation and inflation volatility. For the medium term, many observers are concerned that growth prospects might be somewhat lower, pulling real rates down for some time to come. Both of these forces suggest yield curve levels for the medium term will be lower than the historical norm. But as economic recovery in the US and the UK throughout 2014 consolidates, the Fed's and BoE's tightening cycle (and slow decay of the LSAP programs) is bound to push short-term rates up, and probably lead to a decompression of the current term premium.

Indeed, as of September 2014, the median estimate of Federal Reserve members for the federal funds rate (FFR) at the end of 2015 and 2016 was 1.38 and 2.88, respectively. For longer rates, projections by several sources also anticipate important increases. For instance, as of September 2014, the CBO included in the baseline scenario 10-year treasury rates of 3.3 and 3.8 for the same period. Table 2 summarizes short- and long-term interest rate forecasts from these and other data sources. The table also provides the market-implied increases in these rates, which are taken from futures prices at different horizons.

While one should be wary of drawing conclusions from point estimates that can sometimes change significantly within a few months, the divergence between market and analysts' expectations about rate increases is striking. For the FFR, the market is pricing a significantly slower increase than the Fed—on an instrument

that, after all, is chosen by the Fed itself. For the 10-year rate, a mean increase of 100 bp expected by analysts up to 2015 stands in sharp contrast with the 30 bp increase implicit in market forwards.

Table 2: short and long-term interest rate projections

September, 2014

	FFR		US 10-yr		10-yr rate increase (bp)	
Current	**0.25**		**2.33**			
Forecasts	2015	2016	2015	2016	2015	2016
FED	1.38	2.88	--	--		
Market (forwards)	0.75	1.75	2.63	3.30	30	97
CBO	0.30	1.10	3.30	3.80	97	147
Consensus	0.80	--	3.30	4.10	97	177
Goldman Sachs	0.10	1.30	3.38	3.80	105	147
Central Bank of Chile survey (traders)			3.08	3.56	75	123
Bloomberg Survey (economists)			3.67	3.8*	134	147
Reuters survey (primary dealers)	0.73-1.00	1.88-2.13				

* up to March, 2016

What are the implications of the divergence between these projections? Perhaps the market is right, and rates will increase in the next two years at a relatively slow pace. If this scenario prevails, the normalization of rates will be a smooth sailing process, as owners of long-term bonds will not suffer large losses in their portfolios: for example, the return on a 10-year coupon treasury over a year in which 10-year rates increase by 30 bp, is roughly a break-even.

But what if analysts (and the Fed) are right? Long-term rate increases of 100 bp would indeed inflict significant losses on bondholders. To further elaborate on this point, table 3 calculates the holding return over a one-year horizon for an investor owning treasuries of different maturities, assuming different increases in the yield curve over that same year. The top panel corresponds to returns for coupon bonds (assuming coupons are reinvested at rates consistent with each scenario for the remaining six months), while the bottom panel shows returns for zeros. The left-hand part of the table corresponds to a parallel increase in the yield curve (of 25 through 100 bp in one year), while the figures on the right assume that the shock to

the long end of the curve is half as large as that of the intercept (so the yield curve shifts up, but with a flatter slope).

Table 3: One-year holding return under different yield curve scenarios (%)

Parallel YC shift, as of December 2015

Shock (bp)	3yr	5yr	10yr	20yr	30yr
	Coupon bonds (on the run, issued at par)				
25	1.00	1.47	0.78	-0.71	-1.41
50	0.50	0.51	-1.18	-4.16	-5.82
75	0.01	-0.43	-3.09	-7.46	-9.96
100	-0.47	-1.37	-4.96	-10.61	-13.86
125	-0.95	-2.29	-6.79	-13.63	-17.52
150	-1.43	-3.21	-8.58	-16.52	-20.97
Shock (bp)	Zero coupon bonds				
25	1.01	1.52	0.73	-1.50	-3.01
50	0.51	0.52	-1.46	-5.94	-9.58
75	0.01	-0.46	-3.60	-10.17	-15.70
100	-0.48	-1.43	-5.68	-14.20	-21.39
125	-0.97	-2.39	-7.72	-18.04	-26.68
150	-1.45	-3.34	-9.70	-21.70	-31.61

Intercept shift and lower slope, as of December 2015

Shock (bp)	3yr	5yr	10yr	20yr	30yr
	Coupon bonds (on the run, issued at par)				
25	1.01	1.53	1.06	0.30	0.50
50	0.53	0.63	-0.64	-2.21	-2.19
75	0.05	-0.27	-2.30	-4.64	-4.80
100	-0.42	-1.15	-3.93	-7.00	-7.32
125	-0.89	-2.02	-5.53	-9.29	-9.75
150	-1.36	-2.88	-7.09	-11.51	-12.11
Shock (bp)	Zero coupon bonds				
25	1.02	1.58	1.05	-0.06	0.35
50	0.54	0.64	-0.84	-3.18	-3.24
75	0.05	-0.29	-2.68	-6.19	-6.69
100	-0.43	-1.20	-4.49	-9.11	-10.01
125	-0.91	-2.11	-6.26	-11.93	-13.21
150	-1.38	-3.00	-7.99	-14.66	-16.30

The bottom line of this exercise is that a faster increase in rates could lead to important losses in the portfolios of fixed-income instruments, the more so the longer their maturity. To assess the possible risks associated with this scenario, it is important to understand recent trends in the composition of the demand for treasuries and other fixed-income securities.

Table 4 provides a summary of the evolution of the main holders of US treasuries. Between the end of 2007 and mid 2014, the stock of marketable US treasuries[5] increased by almost 150%. Foreign central banks (who hold about half of the stock) roughly kept up with the pace, increasing holdings by 155%. The Federal Reserve, as part of its LSAP programs, increased its treasuries close to 220%. Significantly, mutual funds have seen the fastest growth (230%) in this category, with an astounding three-fold increase of their holdings before the subprime crisis. These figures are consistent with broader trends into fixed-income markets in the last six

[5] Marketable debt includes all bills, notes and bonds that can be traded in the secondary market. These exclude inter-governmental holdings, such as the debt of the treasury to social security trust funds.

years. For example, using data from Morningstar, Feroli et al. (2014) report that net worldwide fund flows into fixed-income was close to USD 2 Tr between 2008 and 2013, while the figure for equities—the second largest category—was less than 500 billion.

Table 4: US treasuries' growth statistics, by investor class (in US billions)

	December 2007	June 2014	Change (US b)	Change (%)
Outstanding treasuries	9,229	17,633	8,404	91
Marketable treasuries	5,150	12,785	7,635	148
Investor class				
Foreign Central Banks	2,353	5,997	3,644	155
Federal Reserve	754	2,397	1,643	218
Mutual Funds	344	1,136	792	230
Insurance Companies	142	271	129	91

Source: Office of Debt Management, Office of the Under Secretary for Domestic Finance.

In its October 2014 global financial stability report, the IMF warns that there might be important risks associated with these trends. While loose monetary policy is aimed at incentivizing *economic risk taking* (by helping the expansion of credit to firms and households), the exceptional monetary conditions since 2008 might have incentivized *financial risk taking* more. According to the Fund, low rates push investors to *search for yield* by venturing into longer maturities and riskier asset classes, and could explain why markets have rallied recently despite only moderate recovery of the real economy.

The report also highlights the implications for liquidity risk of a higher mutual fund share in asset markets. While the large inflows into fixed-income categories have reduced bid-ask spreads, this might give a false sense of increased liquidity when in fact the opposite is true. Such claims are based on arguments including the increased concentration upon a few large fund families, as well as the tendency of retail investors to "follow the herd". This latter point has been more thoroughly developed by several scholars studying the financial stability implications of the compensation structure in the mutual fund industry. Fund managers are paid

according to assets under management, which respond with a lag (through net inflows) to fund performance relative to industry benchmarks. If a manager expects other funds to sell and depress prices in the short-term, she has incentives to front-run her peers and sell first. This leads to investment decisions that are complementary between different managers, giving rise to more price volatility. What's more, relatively small events such as the Fed's tapering talk in May 2013or the first FFR hike in the foreseeable future—may serve as focal points for investors, triggering widespread selloffs that could seriously impair market liquidity.

Naturally, when funds are forced to sell, all the assets in their portfolios are likely to be sold to some extent. Fixed-income funds holding treasuries, corporate bonds, and emerging market debt (a common asset mix) might then serve as catalysts for balance sheet contagion between events in different fixed-income markets. This is part of the explanation for the large outflows observed from emerging markets starting in May 2013, the same month when the Fed began the tapering talk.

To sum up, improving economic indicators in the US and the UK are likely to ignite a tightening cycle of short-term interest rates in these countries and a decompression of term premia in long-term bonds. While current market-based forecasts imply a slow and smooth convergence to normal levels, a faster pace of rate hikes could lead to losses in fixed-income markets. Given the increased role of mutual funds in fixed-income, this might bring more financial volatility and an even faster increase of long-term rates, to the extent that such losses precipitate investor redemptions and trigger asset selloffs.

IV. Intertwined yield curves: Implications for monetary policy in Chile (and other emerging markets)

In a world with increasing financial integration, monetary policy independence is related to whether monetary policy rate (MPR) decisions in emerging countries, for

example, are independent of those taken in the developed world. In this context, independence is measured by the extent to which, after controlling for the cyclical conditions of a given country—perhaps driven to a large extent by the US business cycle—, the MPR follows what an output-gap/inflation trade off à la Taylor rule would suggest.

In the case of Chile, the ability to run an independent monetary policy has been especially noticeable in the years after the global financial crisis. While US monetary policy has been extremely expansionary, the MPR in Chile was kept at a relatively high level of 5% for almost three years. This difference mainly reflects the divergence of the business cycle: while growth in the US and Europe remained sluggish in the aftermath of the crisis, it averaged more than 5% in Chile between 2010 and 2013. This pattern contrasts with that of the majority of Emerging Market Economies (EMEs), whose short-term interest rates have deviated from traditional Taylor rule metrics to take into account the US Fed Funds rate. It is probably the case that exchange rate considerations played a critical role in this. [6]

The ability and decision in Chile to allow for exchange rate fluctuations and maintain discretion of the MPR started in the early 2000s. The inflation-targeting regime and the flexible FX regime were adopted after the difficult adjustment that Chile endured after the Asian crisis of the late 1990s. Ever since, FX interventions have been the exception rather than the rule.[7] The traditional fear-of-floating associated with balance sheet mismatches and inflation credibility has been left behind as a consequence of an explicit effort to make the flexible FX regime credible. This is a cornerstone of Chile's macroeconomic framework. As in any standard IT regime, the management of monetary policy by adjusting the short-term interest rate is aimed at keeping two-year projected inflation at 3%.

[6] See papers in "The transmission of unconventional monetary policy to the emerging markets," BIS papers 78, august 2014.
[7] See Claro and Soto (2013).

In a context of financial integration, the consequence of having an independent MPR was a strong appreciation of the CLP up to mid 2013 relative to the USD and other developing countries' currencies that followed more closely the US monetary policy. In the last 18 months, since the so-called tapering talk began in April 2013, the CLP has depreciated significantly. This depreciation is partly explained by the expected reversal of rates in the US, but importantly, also because the MPR has been reduced by 200 bp due to Chile's slower growth since mid 2013. This highlights the mechanism of adjustment of the Chilean economy to changes in external conditions, and shows how far monetary policy independence in Chile has gone.

That said, an exclusive focus on short-term nominal rates is too narrow a perspective for analyzing monetary and credit conditions. Linkages of domestic and international financial conditions also occur through other channels, like financial flows (gross and net) and asset price changes, specifically through co-movement of long-term interest rates that are critical for investment decisions and asset valuation. Historically, long-term rates in Chile and other emerging market economies have co-moved with those in the United States and other advanced economies. For example, the monthly correlation coefficient of 10-year US Treasury bond rates and Chilean 10 year BCP rates was about 0,6 between 2005 and 2014.

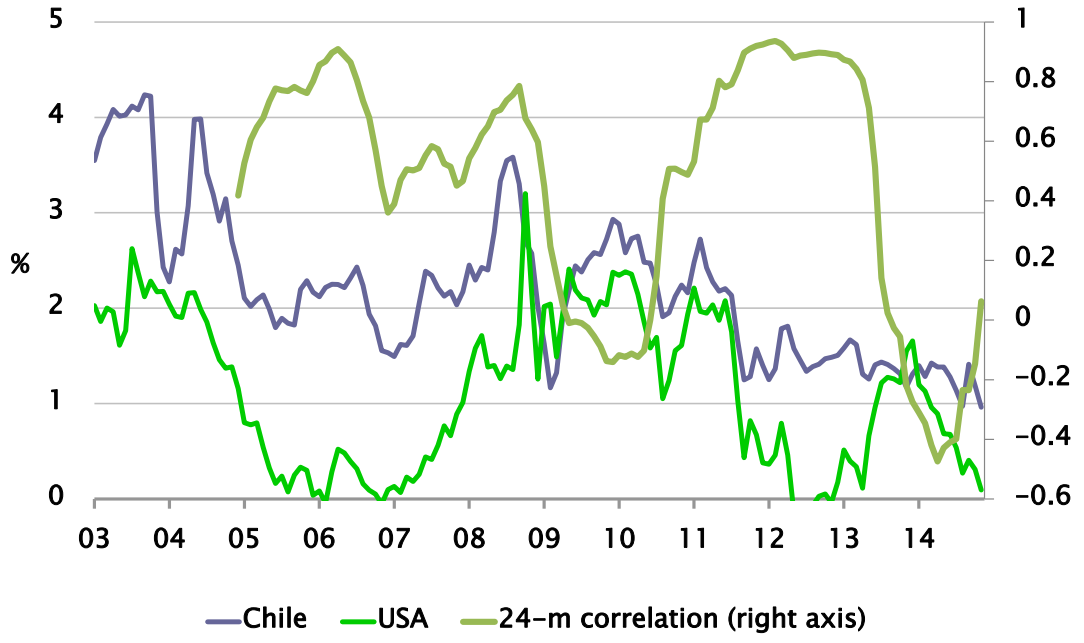
This relationship in long rates has important implications for assessing financial conditions and for evaluating the dependence of local long-term rates upon foreign determinants. The dilemma vs. trilemma debate pointed out by Rey (2013), which emphasizes the limits to monetary policy independence in a context of financial integration, points exactly in the direction of questioning the ability of countries to run independent monetary policy if long-term risk-free yields fluctuate in tandem with US long-term yields.

From a related though different perspective, Obstfeld (2014) argues: "to the extent that long-term rates are strongly subject to global forces, the power of short-term rates to steer the economy could diminish." His paper states that while the ability of

monetary policy to affect inflation dynamics is not fundamentally altered by financial integration and global flows, changes in advanced economies' financial conditions can spill across borders to EMEs in the form of asset price movements and capital flows. This imposes limits to macroeconomic management and highlights the trade-off between inflation objectives and financial stability considerations.

About the decomposition of long-term rates described above, the literature finds that advanced countries' term premia are highly correlated, in particular with US government bond premia.[8] The evidence in Chile points in the same direction; for the period 2003-2014, the correlation between Chile's estimated term premium for the 10-yr bond and the corresponding term premium for the US is 0.61, which is highly significant. [9]

Figure 3: 10-year bond term premia for the US and Chile



[8] See Hellerstein (2011).

[9] The term premium for the US and Chile is calculated using the methodology in Adrian et al. (2013). We thank the authors for making their code accessible for the estimation of the Chilean series.

As shown in Figure 3 however, this correlation is not always stable. Using a 24-month (lagged) rolling window to calculate conditional correlations, the figure shows that in some sub-periods it has not been statistically different from zero.[10] This is evident from two important events. The first happened in the wake of Lehman bankruptcy during the last quarter of 2008, when term premia in the US increased dramatically, while in Chile it actually fell. The second is the aforementioned tapering talk, during which term premia in the US also increased significantly, while in Chile it remained virtually constant.

Overall, the positive correlation between term premia in Chile and the US in the last 10 years has been statistically and economically significant. This suggests that one important—if not the most important—mechanism through which monetary policy in the United States has affected Chile in the last few years is through changes in long-term rates, in particular term premia. As argued above, the extraordinary expansion of monetary policy in the United States has lowered long-term rates to historical lows, partly due to a decrease in the term premium. A similar phenomenon has been experienced in Chile, where long-term rates have decreased almost 200 basis points since January 2010, while the estimated term premium has fallen by around 100 basis points in the same period. Hence, the evidence suggests that while the neutral rates component of long-term yields in Chile reflects largely its independent monetary policy stance—consistently with a divergent business cycle over the past few years—the term premium component seems to be systematically correlated with that of US long-term rates.

The fact that long-term rates in the US influence bond markets in emerging economies is of course highly relevant for policy makers, for several reasons. First, most economic models in modern central banks assign an essential role to financial conditions in determining output and inflation dynamics, so understanding how

[10] With 24 observations and a confidence level of 5%, statistical significance requires an absolute value of the correlation coefficient above 0.41.

domestic long-term rates depend on global fixed-income markets seems like a natural agenda for central bankers.

Second, whether monetary policy strategies that pursue explicit asset pricing objectives—such as lowering long-term rates—are indeed exceptional is not entirely clear yet. After all, the evidence about the effects of LSAP programs presented in Section II suggests that these were quite effective in lowering rates. Faced with this success, it is not obvious that central banks around the world will not adopt similar policies in the future. This will probably depend on how successful these central banks are in the process of normalizing their extraordinary monetary policies, given the possible liquidity and market volatility issues highlighted in Section III. To the extent that asset prices linger as part of central banks' objectives and toolkits, however, this opens up a whole new dimension on how monetary policy is transmitted internationally, with consequences that could extend into financial stability concerns. This is a topic where we have more questions than answers at the moment.

V. Conclusions

Interest rates have been low in the years after the global financial crisis, both at the short- and long-end of the yield curve. This has been a generalized phenomenon for advanced as well as emerging economies, reflecting structural and medium-term trends that have reduced both the future path of expected policy rates, as well as the term premium. This latter component seems to have been particularly compressed due to the LSAP programs by the Fed and other advanced economies' central banks.

As economic growth resumes, rates are bound to go higher in the medium term. Whether interest rate normalization will be a smooth trend remains to be seen, as recent developments in fixed-income markets warns of enhanced risks, in particular due to the predominant role taken by mutual funds in these markets over the past

six years. These developments must be watched closely by central banks around the world, as it becomes increasingly clear that monetary policies are becoming more interrelated through their impact on long-term bond premia across different countries.

In the case of Chile, monetary policy has shown remarkable independence from the actions of most advanced and emerging economies, mainly reflecting a divergent cyclical trend in the recent past. However, the link between long-term rates in Chile and the US is also strong, working mostly through the co-movement of the term premium in what seems to be an unavoidable side effect of financial integration. The Central Bank of Chile is currently incorporating such common trends in its policy analysis, ever committed to pursue an independent monetary policy consistent with its price and financial stability goals.

References

Adrian, Tobias, Richard K. Crump, and Emanuel Moench (2013). "Pricing the term structure with linear regressions." Journal of Financial Economics, 110 (1), 110-138.

Ang, Andrew and Monika Piazzesi (2003). "A no-arbitrage vector autoregression of term structure dynamics with macroeconomic and latent variables." Journal of Monetary economics, 50 (4), 745-787.

Bauer, Michael, Glenn Rudebusch, and Cynthia Wu (2014). "Term premia and inflation uncertainty: Empirical evidence from an international panel dataset: Comment." American Economic Review, 104 (1), 323–337.

Bernanke, Ben. Speech at the Annual Monetary/Macroeconomics Conference: "The Past and Future of Monetary Policy". San Francisco Federal Reserve, March 2013.

Congressional Budget Office (2014). *An update to the budget and economic outlook, 2014-2024*, August.

Ceballos, Luis, Alberto Naudon, and Damián Romero (2014). "Nominal term structure and term premia: Evidence from Chile." Working paper, Central Bank of Chile.

Claro, Sebastián and Claudio Soto (2013). "Exchange rate policy and exchange rate interventions: the Chilean experience." BIS papers 73:81-93.

D'Amico, Stefania, Don H. Kim, and Min Wei (2010). "Tips from TIPS: The informational content of Treasury Inflation Protected Security Prices." Finance and Economics Discussion Series 201019. Washington, DC: Board of Governors of the Federal Reserve System.

D'Amico, Stefania, William English, David López-Salido, and Edward Nelson (2012). "The Federal Reserve's large-scale asset purchase programmes: Rationale and effects." Economic Journal, 122 (564), F415-F446.

Feroli, Michael, Anil K. Kashyap, Kermit Schoenholtz, and Hyun Song Shin (2014). "Market tantrums and monetary policy." Working paper.

Gagnon, Joseph, Matthew Raskin, Julie Remache and Brian Sack (2011). "The financial market effects of the Federal Reserve's large-scale asset purchases." International Journal of Central Banking, 7 (1), 3-43.

Hellerstein, Rebecca (2011), "Global bond risk premiums." Staff Report 499, Federal Reserve Bank of New York, June.

International Monetary Fund: *Global Financial Stability Report*, October 2014.

Joslin, Scott, Marcel Priebsch, and Kenneth J. Singleton (2014). "Risk premiums in dynamic term structure models with unspanned macro risks." Journal of Finance, 69 (3), 1197-1233.

Joyce, Michael, Ana Lasaosa, Ibrahim Stevens, and Matthew Tong (2011). The financial market impact of quantitative easing in the United Kingdom. International Journal of Central Banking, 7 (3), 113-161.

Krishnamurthy, Arvind and Annette Vissing-Jorgensen (2011). "The effects of quantitative easing on interest rates: channels and implications for policy. " NBER WP 17555.

Obstfeld, Maurice (2014). "Trilemmas and Tradeoffs: Living with Financial Globalization." manuscript, University of California, Berkeley.

Rey, Helene (2013), "Dilemma, not trilemma: The global financial cycle and monetary policy independence." Proceedings of the Jackson Hole conference, Federal Reserve Bank of Kansas City.

Wright, Jonathan H. (2011). "Term premia and inflation uncertainty: Empirical evidence from an international panel dataset." American Economic Review 101 (4), 1514-1534.

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