

# Fixed income investments: evolution in a liquidity shortage episode<sup>1</sup>

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## 1. Introduction

During the last decade, the Chilean fixed income market has shown impressive growth in terms of liquidity and deepness.<sup>4</sup> At the same time, institutional investors such as pension funds and mutual funds have systematically increased their presence in this market, to a share of 40% and 14% of total Chilean fixed income assets as at December 2008, respectively. The monitoring of financial stability could therefore be improved with supplementary statistics on the portfolio decisions of such investors, which could be especially valid in light of the financial turbulence during the last quarter of 2008. In this regard, the goal of this paper is to describe how fixed income holdings evolved during this period and to analyse whether they can provide complementary information to the monitoring of financial markets.

More concretely, the information on asset management is a useful complement to the Central Bank of Chile's (CBC) monitoring for several reasons. First, the information content of prices becomes very difficult to analyse during periods of financial turmoil – basically, it is hard to disentangle the incidence of credit and liquidity factors, among others. Second, even though the markets are not necessarily experiencing an episode of financial distress, the dynamics of asset holdings could complement the overall picture to help understand asset prices.<sup>5</sup> Last, but not least, this is relevant because while the conventional belief is that markets stall during financial crises, the empirical evidence about what actually happens in the secondary markets during periods of financial distress is very limited.<sup>6</sup>

In this context, we use data provided by the Depósito Central de Valores (DCV) since June 2008 at a weekly frequency. The DCV processes, collects and registers the holdings of all domestic fixed income assets traded in the Chilean market, ie the stock exchange and the over-the-counter (OTC) market, which implies information on approximately 48,000 instruments each week.<sup>7</sup> This dataset contains detailed information on the value of the outstanding assets, as well as on the issuer, holders, currency denomination and maturity of each instrument.

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<sup>4</sup> For instance, the ratio of trading volume over outstanding public bonds (CBC and Treasury) has increased from close to 1.5 to 2.9 between 2002 and 2007. Source: Larrain & Vial.

<sup>5</sup> For instance, Evans and Lyons (2007) show that the low explanatory power of macro news on the DM/USD exchange rate at a daily frequency – close to 10% – can be substantially improved by including order flows – close to 30%. In other words, roughly two thirds of the total effect of macro news on the DM/USD exchange rate is transmitted via order flow.

<sup>6</sup> Levi-Yeyati et al (2008) provide an overview of secondary markets during episodes of financial crisis in emerging markets.

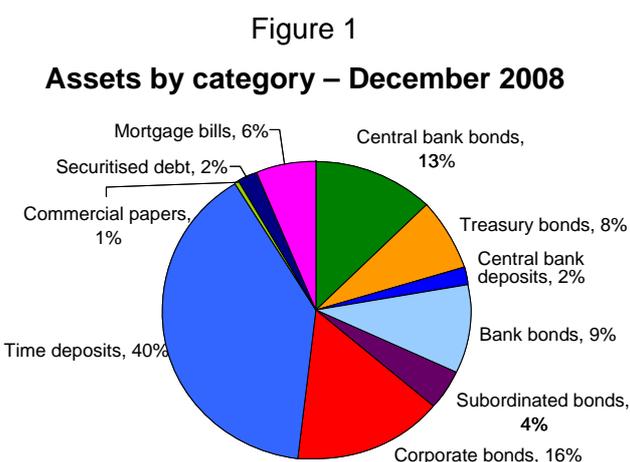
<sup>7</sup> This figure corresponds to the average number of instruments from June 2008 to March 2009.

The rest of the paper is structured as follows. The next section describes the data provided by the DCV. The third section reviews the evolution of fixed income holdings with special attention to the last quarter of 2008 and the fourth section concludes.

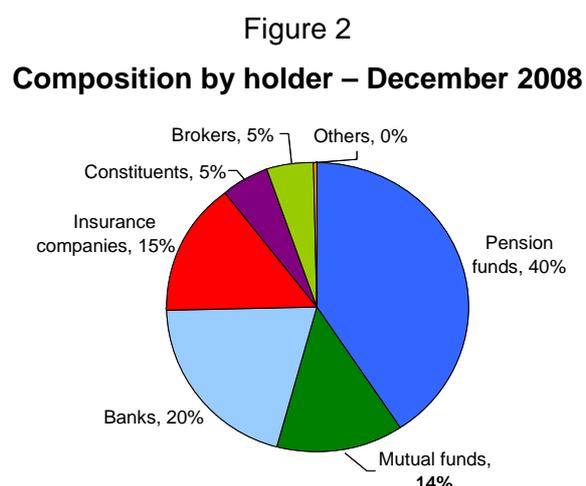
## 2. Depósito Central de Valores (DCV): general background and data description

The DCV is a public corporation established under Law no 18876 in 1993. Its main purposes are, among others, to provide custody services, management, compensation and liquidation of securities. These securities include time deposits, stocks and bonds – public and private – and the like. In general terms, the DCV accounts for the total holdings of fixed income assets issued by domestic agents, which were equivalent to USD 117,039 million in outstanding assets as at December 2008.<sup>8</sup> While the DCV collects information on both variable and fixed income instruments, the CBC receives and analyses only the information concerning fixed income instruments.

By category, the most important fixed income instruments are time deposits with 40% and public bonds (CBC and Treasury bonds) with 21% (Figure 1). It is important to clarify that the time deposits registered at the DCV are those issued by banks and held by institutional and large private investors registered at the DCV, ie traders in the secondary market; time deposits held by households and firms are not registered at the DCV and are therefore excluded – these small investors represent around 40% of the time deposit market. With respect to the asset holders, pension funds, banks, insurance companies and mutual funds represented, respectively, 40%, 20%, 15% and 14% as at December 2008 (Figure 2). Recall that the DCV registers all market positions in the Chilean fixed income market; thus, these figures represent the universe of domestic asset holdings traded on the secondary market and, therefore, the quality of the analysis is not restricted by potential caveats related to the characteristics of the sample data, such as biases to some classes of agent or types of asset.



Source: DCV.



Source: DCV.

<sup>8</sup> The DCV does not produce information on the volume of transactions, but reports the end-of-day position of each holder.

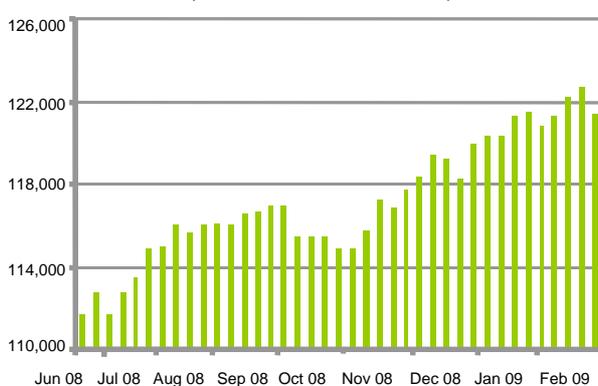
For each asset registered at the DCV, the CBC receives the following data every Monday:

- (a) *Ticker*. This corresponds to the identification code of each instrument, and allows the issuer of each instrument to be specified.
- (b) *Value*. The data is expressed in terms of face value or, equivalently, does not consider any adjustment by any revaluation mechanism. Figure 3 shows the evolution of the total value of assets outstanding reported by the DCV, which increased from USD 112 billion to USD 121 billion between June 2008 and March 2009, where roughly 80% of the instruments are issued by the private sector, while the remaining 20% is public, mainly from the CBC (Figure 4).

Figure 3

**Outstanding assets reported by the DCV**

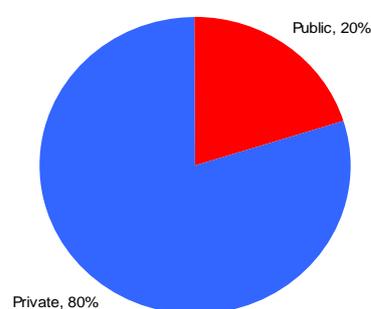
(millions of US dollars)



Source: DCV.

Figure 4

**Privately and publicly issued assets – 2008**



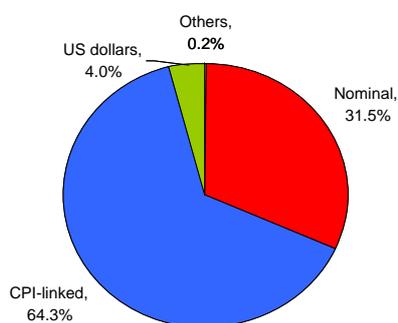
Source: DCV.

- (c) *Currency*. The DCV reports the currency denomination of each instrument. The alternatives are: (i) domestic currency in nominal terms (31.5%); (ii) foreign currency (4%); and (iii) domestic currency and CPI-linked (64.3%) (Figure 5).<sup>9</sup>
- (d) *Maturity*. The DCV provides information with respect to the residual term of the outstanding instruments. Figure 6 presents the share of outstanding assets by maturity term. This figure suggests that the composition of assets by maturity is distributed homogeneously across categories. In effect, the shortest-term instruments (< 90 days) account for 18% of total assets, the category between 90 and 360 days also represents 18%, the category between one and five years is equal to 27% and, finally, the assets maturing in over five years account for 37%.
- (e) *Holder*. The holders are reported in generic groups. This means that, for each asset, it is possible to know the share held by the pension funds as a whole but not the share held by each fund. Holders are classified into: (i) pension funds; (ii) mutual funds; (iii) banks; (iv) insurance companies; (v) brokers; (vi) private investors; and (vii) others.<sup>10</sup>

<sup>9</sup> The CPI-linked instruments use, as a reference, the so-called Unidad de Fomento (UF). The UF is a unit of value adjusted on a monthly basis according to the CPI.

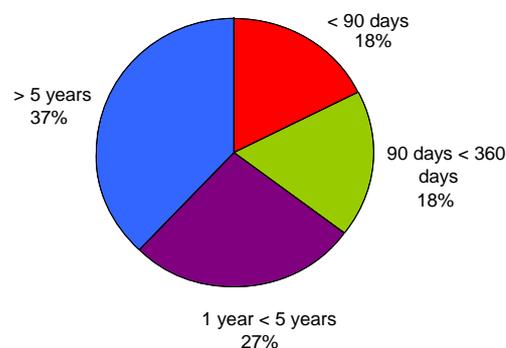
<sup>10</sup> The share of each type of holder is presented in Figure 2.

Figure 5  
Composition of issues by  
currency – 2008



Source: DCV.

Figure 6  
Composition of assets by  
maturity – 2008



Source: DCV.

The available data is from June 2008 up to March 2009, allowing us to inspect in detail how fixed income portfolios behaved during the liquidity stress event in late 2008 and to determine if potential changes could help to complement the monitoring of financial markets conducted by the CBC. It is worth noting that the available data allows the *net change in asset holdings* to be calculated, which summarises both passive and active decisions – ie some assets reaching their maturity (passive), and the buying/selling of assets (active). However, it could be argued that the option of compensating passive changes is an active decision per se and, therefore, this measure could be used as a good proxy for portfolio management decisions.

Finally, it is worth mentioning that the data reported by the DCV is continually checked against the data available at the CBC. Specifically, the internal balance of the outstanding instruments issued by the CBC is compared with the data reported by the DCV, and on only a couple of occasions have some small differences been detected.<sup>11</sup>

### 3. Fixed income assets: June 2008 to March 2009

The events that characterised the Chilean market during the last quarter of 2008<sup>12</sup> can be summarised as follows. The short-term mutual funds – particularly type 1 funds<sup>13</sup> – were revalued at the end of September to the market rates, which caused a negative average daily return of 0.49% on the day of such adjustments, a value highly unusual for this type of fund. This led private investors to sell off their mutual fund shares, causing a liquidity shortage for those institutions. Additionally, the interbank market virtually shut down during those few days and only resumed more normal functions following the announcement of longer repo operations by the CBC on 10 October.<sup>14, 15</sup>

<sup>11</sup> On those occasions, the CBC communicated the differences to the DCV, which corrected them in almost three days.

<sup>12</sup> For a more detailed discussion, see Central Bank of Chile (2009).

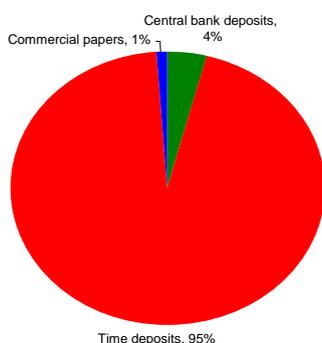
<sup>13</sup> Type 1 funds: the portfolio of type 1 funds only includes assets with duration lower than 90 days.

<sup>14</sup> Because of the complexity of this period, it is hard to explain the exact root of the interbank market shutdown. However, there are some analyses that attribute the reduction in interbank activity to precautionary reasons.

In order to study the dynamics of fixed income assets during the event described above, the assets were classified into the two following categories:

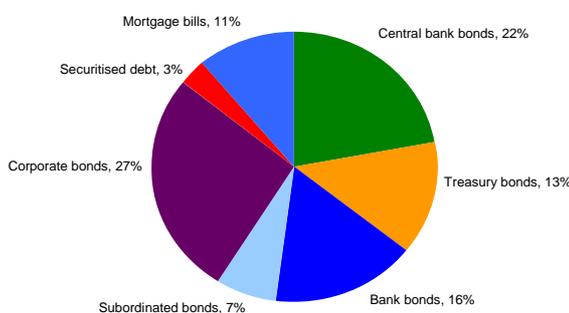
- (i) *Money market instruments.*<sup>16</sup> Most of the assets in this category have a maturity of less than one year – eg time deposits and commercial papers – the exception being CPI-linked time deposits with an average maturity of around 18 months. Figure 7 presents the composition of this segment by asset class, where time deposits accounted for 95% of this market as at December 2008.
- (ii) *Long-term fixed income market.* As its name suggests, this category contains the fixed income instruments with maturities longer than one year, which basically implies bonds issued by the Treasury, the CBC and the corporate sector (Figure 8).

Figure 7  
Composition of money market assets – 2008



Source: DCV.

Figure 8  
Composition of long-terms assets – 2008



Source: DCV.

This segmentation is intended to capture the potential differences between the roles of these instruments. In effect, the money market segment is more closely related to the instruments employed to manage liquidity, while the longer-term instruments are more closely related to investment opportunities and buy and hold investment strategies. This point is partially validated by the relatively higher turnover of the money market. In effect, the ratio between the traded volume and the outstanding money market assets was 5.6 in 2008;<sup>17</sup> by contrast, the turnover of longer-term instruments was 2.2.

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The main elements behind this conclusion are the robustness of capitalisation and the liquidity indicators of commercial banks (they reduce the feasibility of systemic risk). The commercial banks started to use the permanent deposit facilities at the CBC in an unusual way, ie they deposited substantial amounts at the CBC (which runs counter to the liquidity shortage of commercial banks), and the spreads of interbank rates moved in the same direction and magnitude across banks (which runs counter to the idiosyncratic shocks at the bank level).

<sup>15</sup> The details of this announcement can be downloaded from [www.bcentral.cl](http://www.bcentral.cl).

<sup>16</sup> This category is also known as “financial intermediation assets”.

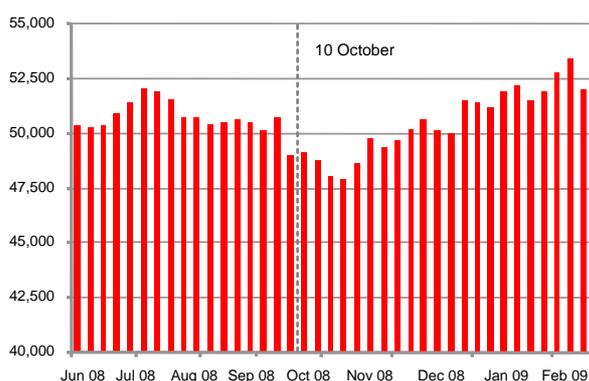
<sup>17</sup> The turnover was calculated using the annual trading volume of each market and the outstanding instruments as at the last week of December 2008. Sources: DCV; Superintendencia de Valores y Seguros.

### 3.1 The money market

Figure 9 shows the weekly holdings of money market instruments. The aggregate asset holdings show a contraction of just 3% during the week of 10 October (the dotted line in the figure), recovering to their previous level a few weeks later. In other words, the aggregate holdings of money markets did not show a significant drop during the liquidity stress episode, and the level observed before the event was reached in a short period. However, the changes in the money market began two weeks prior to that, on 3 October. In effect, a more detailed and focused analysis on time deposits – the main asset in the money market category – shows important changes in terms of the holders during that week (Figure 10). Specifically, the holdings of this instrument by mutual funds and private investors were highly responsive, while the holdings of pension funds showed a steadily decreasing trend without major fluctuations.<sup>18</sup> In fact, the share of mutual funds decreased by around 4.6% in the first week of October, which was partially compensated by a higher demand for time deposits by private investors – its share increased by 3%.<sup>19</sup> In other words, private investors reduced their direct exposure to mutual funds,<sup>20</sup> but they compensated their portfolios through a direct exposure to time deposits.

Figure 9

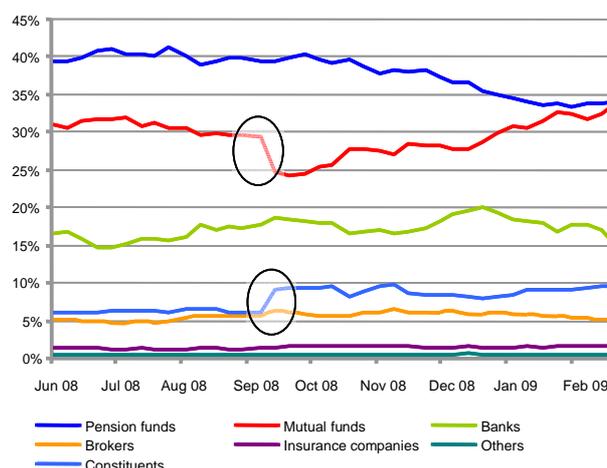
**Money market instruments**  
(millions of US dollars)



Source: DCV.

Figure 10

**Time deposits by holder**



Source: DCV.

With respect to interest rates, even though the aggregate quantities did not move very much, the 30- and 90-day interest rates jumped 263 and 278 basis points one week after the rebalancing of time deposit holders (Figure 11).<sup>21</sup> Given the short sample period, it is virtually impossible to formally establish a sequence of causality. Nonetheless, this apparent precedence is consistent with dynamics potentially observed during periods of liquidity shortage where sellers struggle to find buyers, and prices therefore fluctuate beyond their fundamentals due to such frictions. In this sense, the precedence of the portfolio shift

<sup>18</sup> The smooth reaction of Chilean pension funds is consistent with findings provided by Raddatz and Schmukler (2008).

<sup>19</sup> The category “constituents” corresponds to private investors.

<sup>20</sup> Recall that during the last week of September, private investors ran against mutual funds.

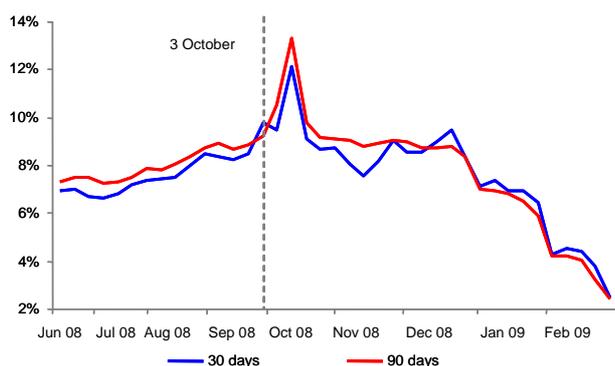
<sup>21</sup> The evolution of longer interest rates is close to the path of 30- and 90-day interest rates.

suggests that monitoring the composition of portfolios could help to improve the monitoring of financial stability by the CBC.

Another dimension to analyse is the maturity of time deposits. The average maturity of the outstanding time deposits exhibits a systematic reduction from around 312 to 246 days without significant fluctuations (Figure 12). This finding highlights another aspect of the time period under analysis: the flight to liquidity. The maturity is a characteristic related to the liquidity of assets, thus, its reduction is clearly a consequence of higher demand for liquidity. Figure 12 also shows the evolution of maturity for large- and medium-sized issuing banks,<sup>22</sup> where the trend is similar across both categories.

Figure 11

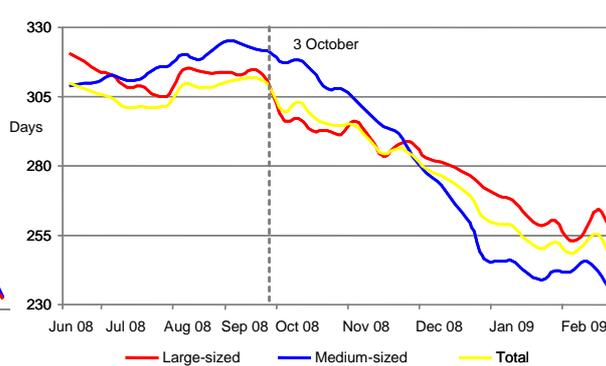
Interest rate of time deposits



Source: DCV.

Figure 12

Maturity of time deposits



Source: DCV.

From the issuers' perspective, the changes in maturity and interest rates seem to be related to the exposure of each institution to mutual funds. Figure 13 plots the initial exposure of each issuing bank to mutual funds, measured as the percentage of time deposits of each bank held by mutual funds as at the week of 17 September, and the change in the time deposit interest rates between 26 September and 17 October. The relationship between these variables seems to be positive, meaning that higher exposure to mutual funds (ie the agent with liquidity problems) has a greater effect on the interest rate of issued instruments. Figure 14 shows a similar scatter with the change of maturity of time deposits at the bank level, and the relationship is positive (ie lower exposure, lower maturity reduction). In other words, the potentially less-affected banks reduce the maturity, which suggests the prevalence of supply over demand factors.<sup>23</sup> Obviously, these relationships involve both supply and demand factors, but beyond stating the relevance or link between these factors, these kinds of dynamics at the bank level reinforce the idea of analysing micro-level data during liquidity events.

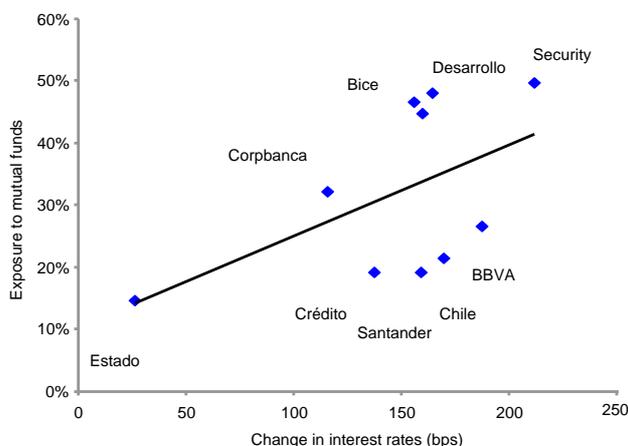
As the sample period is short, the findings highlighted in this section are therefore preliminary, and their robustness is conditional to constructing a longer dataset. Given the previous disclaimer, the main preliminary findings are that changes in asset holdings seem to precede interest rate movements, and that both aggregate dynamics and portfolio changes are relevant.

<sup>22</sup> This classification is based on a cluster analysis and is reported by the Central Bank of Chile (2008).

<sup>23</sup> In effect, given the spike of interest rates and the uncertainty about their future path, the less exposed banks could be better placed to avoid the issuance of longer-term deposits, and vice versa.

Figure 13

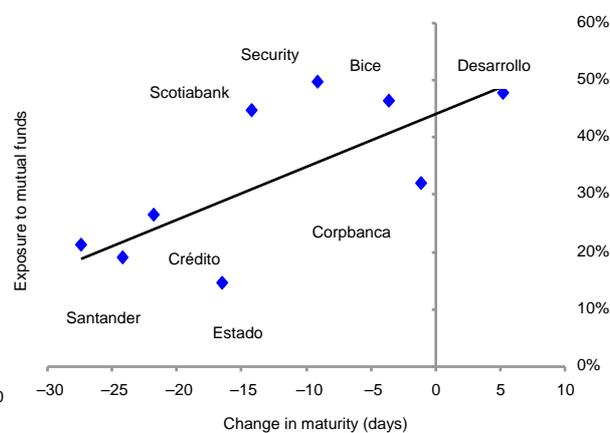
**Change in interest rates and initial exposure to mutual funds**



Source: DCV.

Figure 14

**Change in maturity and initial exposure to mutual funds**



Source: DCV.

### 3.2 The long-term market

The case of long-term fixed income instruments has a distinctive feature with respect to money market instruments. Their issuance is greatly determined by the CBC – which accounts for 20% of the issuance of these instruments – where the decision about how much to issue is more related to monetary policy goals than to investors' demands (ie the supply is more exogenous than in the money market). Therefore, the analysis in this case is more focused on the following portfolio decision: how do the agents rebalance their portfolios between nominal and CPI-linked instruments?<sup>24</sup> The relevance of this point lies in the fact that CPI-linked instruments are more liquid than nominal instruments in the Chilean market (Jervis (2008), Mendoza (1992)), therefore, it would be plausible to expect that agents rebalance their portfolios towards CPI-linked instruments during episodes of liquidity stress. However, it is difficult to disentangle the potential effect of liquidity from other factors such as inflation risk. In fact, based on a standard time series analysis, the conditional volatility of the CPI forecast shows an increase at mid-year 2008.

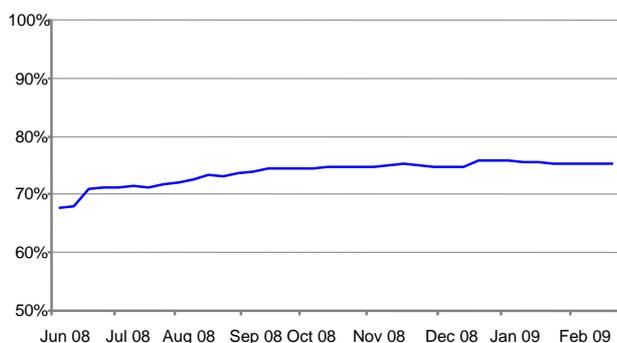
Figures 15 and 16 present the share of CPI-linked instruments issued by the CBC as a percentage of the outstanding value of total instruments issued by the CBC and the share of CPI-linked instruments held by each type of agent, respectively. In aggregate terms, the total share of CPI-linked instruments increased steadily from 68% to around 76% between June and September 2008 (Figure 15). However, the decomposition by agent suggests wider and heterogeneous fluctuations among investors. On the one hand, there is virtually no change in the portfolios of pension funds, which is consistent with evidence on the tendency of these institutions to buy and hold assets (Raddatz and Schmukler (2008)). On the other hand, banks tend to systematically increase their portfolios of CPI-linked instruments from values in the range of 50% to 70%; the portfolio of longer-term instruments held by commercial banks was tilted towards CPI-linked instruments. The portfolio adjustment of commercial banks had, as a counterpart, the lower exposure of mutual funds to CPI-linked securities: the share of these decreased from 65% to somewhere in the range of 40%. In general terms, the

<sup>24</sup> We avoid the comparison of interest rates (CPI-linked and nominal), because the changes in inflation expectations and liquidity premiums during this period cannot be discarded.

observed adjustment could be summarised as a rebalancing towards liquid instruments by relatively liquid agents (banks) having as a counterpart the sale of those instruments by the less liquid agent (mutual funds).<sup>25</sup> Meanwhile, the buy and hold investors' type (pension funds) does not react greatly to liquidity events.

Figure 15

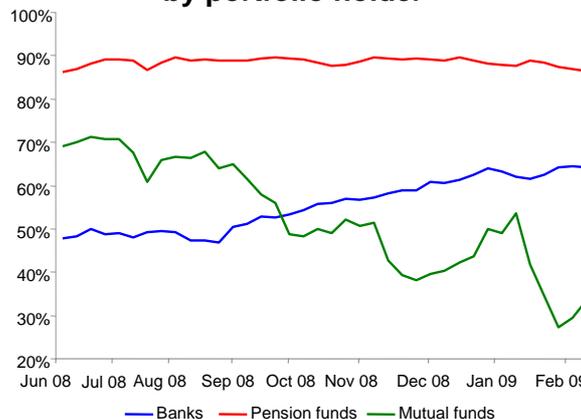
Share of CPI-linked assets



Source: DCV.

Figure 16

Share of CPI-linked assets by portfolio holder



Source: DCV.

## Summary

The purpose of this paper was to provide an overview of the DCV database as a complementary source of information to monitor the financial stability of the Chilean market. This dataset contains information on asset holdings that account for the entire domestic fixed income market, providing detailed information about the issuer, nominal value of each asset, maturity and class of agent that holds each asset (banks, mutual funds, pension funds, insurance companies, etc). This information is available from June 2008 to March 2009 at a weekly frequency.

Even though the sample period is relatively short, it covers the liquidity stress period of September–October 2008, and thus the analysis could be useful to understand the dynamics during these types of events. Obviously, the analysis should be enriched to the extent that the database considers more observations. In this sense, this paper constitutes a first step towards a deeper and more detailed analysis focused on portfolio management decisions.

Given the above, the main points are the following. The institutions that were more greatly affected initially by the liquidity contraction (mutual funds) reacted by abruptly reducing their more liquid assets (time deposits) – this asset sale preceded a more generalised response of the aggregate interest rates of these instruments, and the effect at the bank level seems to be related to the initial exposure to mutual funds. Also, and just as importantly, the rebalancing of portfolios in longer-term assets shows that the banks increased their exposure to CPI-linked instruments, which was compensated by a lower exposure of mutual funds to these instruments, while pension funds exhibited a more stable pattern.

<sup>25</sup> Mutual funds were one the most affected agents during the liquidity stress event at the end of September 2008 (Central Bank of Chile (2009)).

## References

Central Bank of Chile (2008): *Financial Stability Report*, H2 2007.

——— (2009): *Financial Stability Report*, H2 2008.

Evans, M and R Lyons (2008): “How is macro news transmitted to exchange rates?”, *Journal of Financial Economics*, vol 88, issue 1, pp 26–50.

Jervis, P (2008): “La compensación inflacionaria y sus componentes en Chile”, *Economía Chilena*, vol 10, issue 2, pp 27–56.

Levy-Yeyati, E, S Schmukler and N van Horen (2008): “Emerging market liquidity and crises”, *Journal of the European Economic Association*, vol 6, no 2–3, pp 668–728.

Mendoza, E (1992): “Fisherian transmission and efficient arbitrage under partial financial indexation: the case of Chile”, *IMF Staff Papers*, vol 39, issue 1, pp 121–47.

Raddatz, C and S Schmukler (2008): “Pension funds and capital market development: how much bang for the buck?”, *World Bank Policy Research Working Paper*, no 4787.