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State Aid and Bank Intervention: the ING Illiquid Assets Back-up Facility (IABF)

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State Aid and Bank Intervention:
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Abstract:

The ING Illiquid Assets Back-up Facility announced January 2009 was a SWAP-based insurance to reduce ING's exposure to Alt-A related risk. Did the deal involve state aid? Using marketprices to evaluate the SWAP directly is impossible because markets for Alt-A based CDOs had collapsed. We therefore assess the deal's impact on the market's valuation of ING to answer the question. We need to correct for two concurrent events: the announcement of the fourth quarter results and the CEO. We find state aid to be between 1.1 and 2.2 b€. Thus the European Commission's estimate that the IABF entails b€ 5 state aid is at variance with the assessment derived from market based valuations. Moreover, the intervention only had a significant impact on equity values and apparently not on debt values, indicating that ING was sufficiently capitalized.

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1 Introduction

In this paper we analyse the ING Illiquid Assets Back-up Facility (IABF) that was announced on 26 January 2009. The IABF was a unique intervention in that it was not constructed as a straight recapitalisation, but as a SWAP-based insurance mechanism to reduce ING's exposure to Alt-A related risk. Insurance based interventions had been introduced before in the US and in the UK, but of a different structure. The US and UK interventions were essentially put options written by the authorities on a substantial slice of a ringfenced portfolio of risk assets, in return for warrants on the bank involved. The IABF on the other hand was a straight swap between (80% of) the returns on a Alt-A based portfolio for the returns on a State bond, set up as a synthetic transaction for reasons we will discuss below. Implicit in the swap was a 10% discount on the Alt-A portfolio. A key question is whether the pricing of the deal involved state aid. Since liquidity in the Alt-A market had dried up at the moment the SWAP was executed, the answer to that question is far from straightforward. In this paper we use the impact of the deal on the market's pricing of ING risk to answer that question.

Much of the debate surrounding bank bailouts focuses on the rationale for intervention and the cost to taxpayers. There has been little debate on the effectiveness of specific interventions, both in policy circles and, possibly more surprizingly, in the academic literature. A systematic and wide ranging analysis of how to structure bank rescues is mostly lacking. Maybe not surprizingly therefore, we have seen a wide range on ontervention modes since the credit crisis erupted mid 2007. From forced mergers with healthier banks (Bear Stearns) to actual bankruptcy (Lehman), from Bad Bank models (Ireland) to a variety of recap approaches (Germany, France, the Netherlands, the US in 2009).

We have also seen more innovative approaches, based on an insurance model rather than recapitalization, much in line with the early discussion in Kashyap e.a. (2008). Examples are the put option provided to a collection of ringfenced assets for Bank of America and CityGroup late 2008 and several similar interventions in the UK in early January 2009. After an initial round of more conventional interventions in October 2008 failed to calm the market in the Netherlands, in particular for the ING, the largest Dutch bank, a more innovative approach was designed based on three principles: first, a thorough independent valuation of the assets to be underwritten should

be the starting point. Second, the intervention would be insurance based, because of its countercyclical nature, yielding money in bad times and costing money in good times, as suggested in Kashyap e.a. (2008). And third, the insurance mechanism waas to be designed in such a way that proper management incentives for the presumably more knowledgeable owner would be maintained, which was expected to greatly lower the eventual cost of the scheme (as suggested in van Wijnbergen 1997).

January 26, 2009 a cash flow swap based on these principles was engineered between ING and the Dutch Finance Ministry, in which effectively the returns on a 30 bE portfolio of Alt-A mortgage based CDO's were swapped for the returns on appropriately sized Dutch Govenment securities. An important feature of the deal was that 20% of the portfolio risk was left with ING, and 80% was swapped out. The transaction incorporated a discount of 10%. The advantages of this set up were two fold: first, the Dutch State would actually make money on the scheme if the portfolio performed well, and would only pay out if it did not. Therefore it had the insurance aspects promoted by Kashyap e.a. (2008). And second, since 20% of the overall risk was left with the ING, the bank in fact still had strong incentives to manage the relevant SIVs properly, along the lines suggested in van Wijnbergen (1997). It was set up as a synthetic asset swap of the entire portfolio returns precisely for that reason, so as to leave management incentives with the ING for each individual instrument. To split individual instrumetns 80/20 was unnecessarily complicated, and to simply swap 80% (in value terms) of the asssets would have left no management incentives for those 80%. Hence the decision to swap the entire portfolio's returns 80/20.

One particular aspect of this deal is playing an important role in current disputes between the ING and the European Commission: how much state aid was involved in this transaction? It is clear that because of the complexity of the transaction and the fact that it took place in the middle of a generalized liquidity crisis, standard State Aid rules are not helpful in answering this question. Yet it is of great importance, not only for an assessment of the budgetary consequences for the Dutch Government, but also because the EU Comission ties required remedies to the amount of state aid received as proportion of the receiving institution's balance sheet.

The standard way of assessing the amount of state aid involved is to compae the terms at which the transaction took place with marketprices. But markets for subprime or Alt-A mortgage based CDOs had literally collapsed, with liquidity drying up completely making relevant market prices unavailable; that was in fact the beginning of the crisis (Brunnermeyer 2009). To assess

the extent to which state aid was involved, we chose an alternative route, using the approach of Veronesi & Zingales (2010): we investigate the immediate impact of the IABF on ING's market valuation.

First an event study on share prices is done to estimate the immediate benefit to shareholders, as a result of the announced intervention. Second, CDS prices are used to calculate the implicit change in the value of bonds. In both event studies, the 'abnormal return' rather than the 'raw return' is investigated by comparing the change in share prices and CDS prices to a relevant market index over the same period. Furthermore, an estimate is made of the impact of two concurrent events: the announcement of the fourth quarter results and the CEO changeover - both announced on the same day as the IABF - in order to further isolate the effects of the IABF. These market valuations reflect both direct and indirect effects of the IABF.

The remainder of this paper is organized as follows. Section 2 describes the state aid received by ING. Sections 3 and 4 present an event study on share prices and CDS prices, respectively. Section 5 investigates direct and indirect costs of the intervention. Robustness checks are carried out in section 6, and section 7 concludes. Finally, a set of annexes contains an extensive description of data used.

2 Description of government interventions at ING

ING Group has received government support on two occasions. In October 2008, a capital injection was given and in January 2009 the Illiquid Assets Back-Up Facility was introduced.

October 2008 intervention

In October 2008, the Dutch government announced a recapitalization scheme worth €20 billion. ING Group was the first and largest participant in this scheme. On 19 October 2008, ING Group accepted a €10 billion capital injection under this scheme, in exchange for securities and government participation in operational and investment decisions. Soon after, two other financial companies also participated in the scheme: AEGON (€ 3 billion) and SNS Reaal (€ 750 million). ING had to pay a fixed interest rate of 8,5% initially, with later interest rates tied to dividend pay out ratios. But, in order to let the loan count as tier-1 capital, interest was due only if the ING paid out dividends on its regular shares. The Dutch Finance Ministry imposed a 50% prepayment

penalty. The State received a put option guaranteeing in effect at least the principal amount of the cash infusion after three years, and a 50% cap over par on swapping back the issued securities for regular shares, also after three years.

This capital injection was intended to put to rest concerns about a capital shortage. But as market circumstances worsened as the fall out of the Lehman bankruptcy spiralled out of control, problems at ING re-emerged. In particular the large portfolio of alt-A based RMBS on ING's books was increasingly seen as a problem. Uncertainty about in particular the correlation between the cash flows of the underlying mortgages as the US housing market collapsed, led to a sharp decline in demand for these securities and the market value dropped precipitously. In fact a full blown liquidity crisis developed (Brunnermeyer 2009), with in particular the market for RMBS based securities drying up completely (Gorton 2009).

For a highly leveraged institution, like most European banks are, uncertainty about the value of its assets is of course highly problematic, and a second intervention was therefore deemed necessary. The Alt-A portfolio was (mostly) held by ING direct-USA[1], the internet based direct banking subsidiary of ING that had invested in these assets under pressure of US regulation requiring thrifts to invest predominantly in housing related assets. In the market circumstances prevailing at the time, selling a portfolio as large as this one was not possible unless at extreme firesale prices. A more appealing option would be for ING to hold on to the portfolio, but to find a way to buy insurance against low cash flows to allay creditors' and shareholders' fears. The second intervention did just that: it was designed specifically to reduce the volatility of the future cash flows from this portfolio.

January 2009 intervention

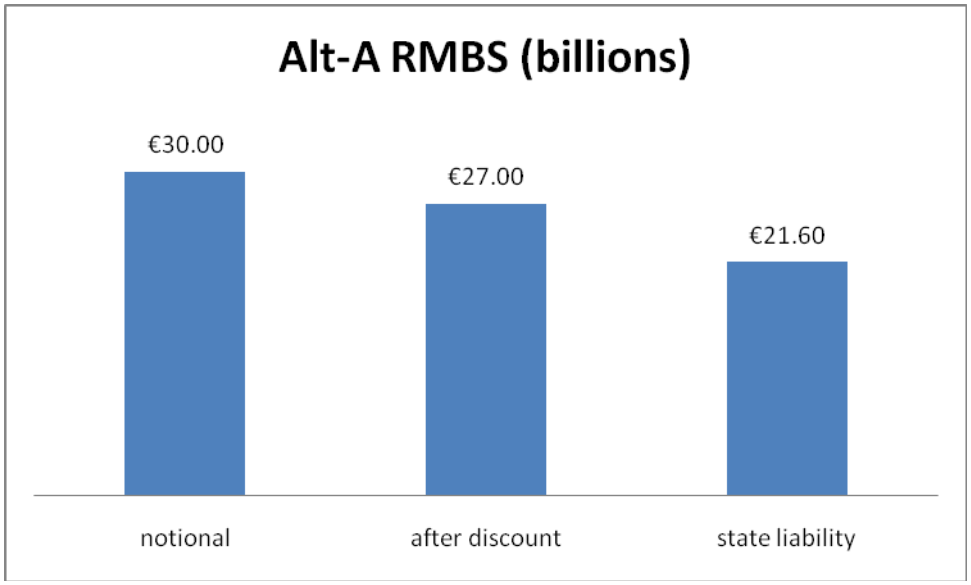
On 26 January 2009, the Dutch government introduced a so-called asset insurance scheme, designed specifically for ING. This scheme, described as an 'Illiquid Assets Back-Up Facility' is structured as a cash flow swap. ING remains the legal owner of the Alt-A RMBS portfolio, but passes 80% of the cash flows on to the state. In exchange, ING receives a stable cash flow from the state. In economic terms, though not legally, this means that the state has contracted a liability in the form of a 'synthetic' government bond[2] at a value of € 21.6 billion. Figure 1 below

[1] A small part was held by ING insurance.

[2] No government debt was issued, but the state has committed itself to provide an income stream to ING Group 'as if' ING Group owns a government bond

illustrates how this amount was determined. The notional value of the Alt-A RMBS was € 30 billion. In the exchange, a 10% discount was applied: an outside consultant estimated that € 27 billion was a more accurate assessment of the fundamental value of the portfolio[3]. In the deal, 80% of the portfolio's cash flows are guaranteed by the state. The scheme leaves ING exposed to the remaining 20% of cash flows from the portfolio, to provide an incentive for active asset management by ING, resultiong in a bond (synthetically) swapped in of 80% of 27, or 21.6 bE.

Figure 1: value of Alt-A RMBS (billions) and state liability



According to the financial closing (Ministry of Finance, 2009b), the transaction between ING and the state consists of the following 4 components.

The state receives:

- 80% of all cash flows (interest and repayment) from the Alt-A RMBS portfolio
- a 'guarantee fee' of 55 basis points per annum on the outstanding portfolio

ING receives:

- a 'funding fee' which represents the interest on the 'synthetic' government bond, 57% being a fixed rate of 3.5% and 43% a floating rate of LIBOR + 50 basis points. The funding fee also includes an amount related to the reduction in the portfolio
- a 'management fee' of 25 basis points for managing the Alt-A portfolio.

[3] Prior to the intervention, ING had already applied an impairment of € 2.3 billion and the portfolio, together with a revaluation reserve, was in the books for an amount of € 27.7 billion.

From the point of view of ING, a volatile cash flow from Alt-A RMBS was replaced by a much more stable cash flow based mostly on a fixed long term rate and partially to LIBOR. The state has assumed most of the risk associated with the Alt-A RMBS and this provides ING with a reduction in risk-weighted assets and matching improvement of tier-1 capital ratio. Indeed, in its press release (ING, 2009), ING states that the intervention reduces risk-weighted assets by approximately EUR 15 billion, raising ING Bank's Tier-1 ratio by approximately 40 basis points to 9.5% and the core Tier-1 by 32 basis points to 7.4%. This freed up capital for lending. Therefore, in return for this guarantee, ING has agreed to assign €25 billion in additional credit to individuals and organizations in the Netherlands. In addition, ING had to suspend bonuses to the entire board of directors, and government nominated members of the ING Supervisory Board had approval rights for decisions concerning equity issuance or buyback, strategic transactions with a value equalling more than one quarter of ING's share capital and reserves and proposals to shareholders regarding the remuneration policy.

State aid aspects

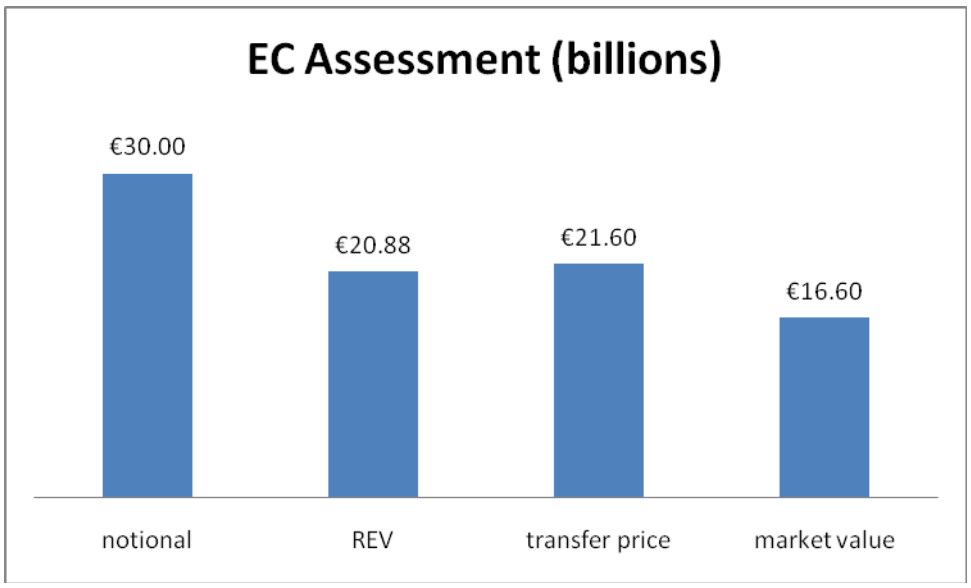
A direct assessment of state aid would have required a model based valuation of the Alt-A portfolio, since market prices at that time of extremely reduced liquidity in markets for structured products were basically non-existent. But the very modeling techniques used to assess structured products have come under serious attack since the ratings based on these models have been shown to be spactacularly wrong, with entire assetclasses/cohorts being several notches downgraded in 2008 (Benmelech and Dlugosz 2010, Gorton 2010). However we can assess the market's view on the state aid issue. The intervention should have had a twofold impact on the market value of the ING and its debts. First there is of course the cash value of state aid embedded in the swap itself, if any. In addition, if the reduced volatility contributes to a lower assessment of chances on future liquidity squeezes of the ING Bank as a whole, there could be an additional systemic effect on the valuation of the ING. Thus the market value response to this deal should be considered an upper bound on the amount of state aid received under this deal, overestimating it by the value of the systemic impact.

European Commission's view of the IABF

The European Commission took a different view. It considers recapitalizations and asset relief programs *prima facie* to be state aid. And when state aid exceeds a threshold of 2% of risk-weighted assets (RWA), the Commission requires in-depth restructuring to ensure a level playing between financial institutions and so limit distortion in competition.

The assessment by the European Commission of the fundamental value (i.e. the market value in "normal" circumstances, was very close to the estimates of the participants in the deal, at 21.8 bE for the 80% swapped out to the state. But the EC decided to asses the amount of state aid by comparing with proxies for actual market prices rather than an estimate of market prices in normal circumstances (i.e. the Real Economic Value, in the EC's terminology), as summarized by the graph below:

Fig.2: EC Assessment of State Aid embedded in IABF



The Commission calculates the amount of state aid as the difference between the transfer price (the amount of the liability contracted by the state) and the market value. The Commission states that ideally the transfer price of the Alt-A RMBS should reflect the fundamental long term economic value, or real economic value (REV), but nevertheless decided to determine the amount of state aid using the within-crisis-market value"" proxy instead of the REV. The Commission

accordingly concluded that the amount of state aid associated with the IABF amounted to € 5 billion although the transfer price was close to the EC's own estimate of the REV.

The Commission also took into account the € 10 billion capital injection that had been received in 2008. Part of this capital injection has already been repaid by ING, and ING has received a € 2 billion reduction in early repayment penalty (originally aequal to 50% of principal). This reduction was similar, though slightly more generous, than the reductions in repayment premia that had been received by AEGON and SNS Reaal. The Commission added up these amounts: € 10 billion received in October 2008, € 5 billion for the IABF and €2 reduction of a repayment penalty. The total amount of subsidies received by ING Group in 2008 and 2009 is then € 17 billion[4]. When compared to the RWA of ING's banking division, this represents 5 % of the bank RWA of € 343 billion (at year-end 2008).

Based on these findings, the European Commission ordered a revision of the guarantee fee and other fees. The initial, closing and revised terms are summarized in the table below:

Table 1: Initial, closing and revised terms of the IABF

	Initial terms	**Financial closing**	**Revised terms**
Transfer price based on REV	90 %, or € 21.6 bn	90 %, or € 21.6 bn	No revision
Funding fee: - Fixed rate (57%) - Floating rate (43%)	 3.0% p.a. LIBOR	 3.5% p.a. LIBOR + 50 bps	 3.0% p.a. LIBOR
Management fee	50 bps	25 bps	25 bps
Guarantee fee	50 bps[5]	55 bps	137.6 bps

Furthermore, the Commission has ordered ING to reduce its consolidated balance sheet by 45% of total assets (as of Q3, 2008), by selling all insurance operations and reducing the bank division's balance sheet by 28%. To achieve the required reduction of the banking division's balance sheet, ING Direct and WestlandUtrecht Bank had to be sold. Another requirement from the Commission is that no price leadership is allowed, to avoid unfair competition.

[4] Note the apparent double counting. If the 10 bE intervention would have been priced at post-reduction rates, it would have counted for 10 bE as state aid; now it counts as 12 bE.
[5] Own estimate based on the announcement that the guarantee fee and management fee would more or less cancel each other out.

Goldman Sachs has argued in an analysts' report(Goldman Sachs, 2010) that it is debatable whether the € 2 billion reduction in repayment premium should be taken into account, considering that AEGON and SNS Reaal also benefited from similar reductions and were not similarly penalized. Moreover, even after the reduction, the overall effective rate of interest is still above 15% pa, a threshold that the EU has indicated above which loans are not considered to embed state aid. If they are excluded, the amount of state aid would be € 15 bn (counting the full € 10 bn in spite of the the effective interest rate being above the Commission's own threshold of 15%). Moreover, Goldman Sachs also point out that € 4 billion out of the € 10 billion capital injection was injected into ING's insurance division, not the banking division. Dividing an amount of € 15 billion in state aid by the total group RWA of € 556 billion (rather than just the banking division's RWA), the figure would be 2.7% of total RWA. This means the 2% threshold would still be exceeded, but to a much smaller extent. In this light the restructuring required by the European Commission may have been too harsh even if one accepts the view that the claim that the IABF embedded € 5 bn state aid. Whether that claim is reasonable is the question we turn to now.

3 Shareholder value created by the IABF

Stock prices are supposed to reflect the discounted value of all future cash flows, properly correcting for risk and incorporating all relevant and available information. Therefore, event studies, which are based on stock price changes, should measure the financial impact of a change in corporate policy, leadership, or ownership more effectively than a methodology based on accounting returns. The inference of significance relies on the following assumptions: (1) markets are efficient, (2) the event was unanticipated, and (3) there were no confounding effects during the event window (McWilliams & Siege1, 1997).

Possibly the most crucial research design issue is the length of the event window used in an event study. McWilliams & Siegel (1997) argue that a short event window will usually capture the significant effect of an event. They cite a study by Dann, Mayers, and Raab (1977), who found that the market price of a stock fully adjusts within 15 minutes of the release of firm-specific information, as well as a study by Mitchell and Netter (1989), who found that the stock market reacted within 90 minutes of news wire stories announcing proposed federal tax

legislation. Because it is much more difficult to control for confounding effects when long windows are used, an event window should be as short as possible. It should be long enough to capture the significant effect of the event, but short enough to exclude confounding effects.

3.1 Methodology

Following Veronesi & Zingales (2010), we use a two-day event window, from Friday 23 January (t-1) until Tuesday 27 January (t+1). The cumulative returns during this period must be corrected for the general movement of the market. We determine the abnormal return by correcting for the general market return movements during the same time frame using CAPM and the equity β (estimated on pre-crisis data):

(1) $$\partial AR = \partial SR - \beta * \partial MR$$

AR = abnormal return
SR = actual stock return
B = equity beta
MR = market return

Stock returns are composed of change in the stock prices as well as dividend payments. ING paid no dividends during the event window.
The equity beta (β) is a measure for the covariance between an individual stock and the market portfolio and equals the slope of the regression line when the returns of an individual stock are regressed on the market returns.

Then the increase in shareholder value (SV) due to the event studied is:

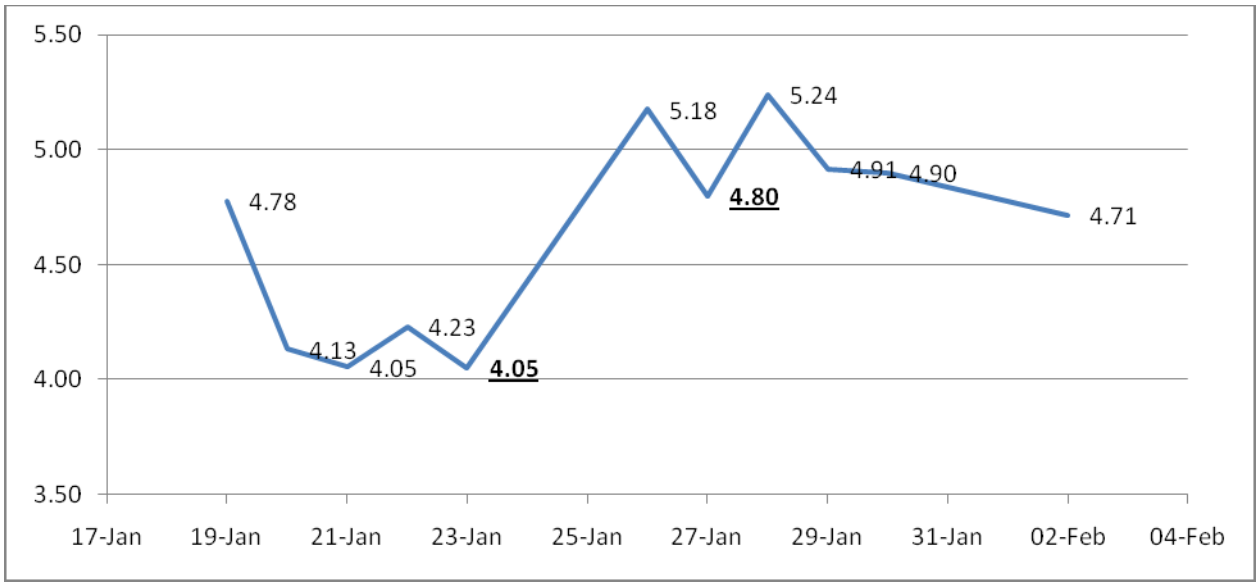
(2) $$\Delta SV = P0 * NOSH * AR$$

P_o is the share price before the event
NOSH = number of shares outstanding

3.2 Application

In the appendix, we provide a detailed description of the data used. During our event window, ING's share price went up from 4.0513 to 4.7992, an increase of 18.5%.

Fig.3: ING stock price January 2009



However, the market also went up. As the default benchmark for ING, we used the Amsterdam Stock Exchange (AEX); this index went up from 234.14 to 248.59, an increase of 6.2%. We use a beta of 1.5, based on weekly returns data of 2008. This gives an abnormal return of 18.5-1.5*6.2 = 9.2 %. This is the increase in return that cannot be explained from overall market returns.

This abnormal return captures the impact on the share prices of all *unanticipated* events of 26 January. Unfortunately, the announcement of the IABF was not an isolated event, but it was 'contaminated' by two other events on the same day: the announcement of the financial results of the 4th quarter of 2008 and the announcement that Michel Tilmant, CEO of ING Group, would step down to be replaced with Jan Hommen, previously the chairman of the supervisory board. If these concurrent events were *not* anticipated, then they are *included* in the abnormal return calculated above.

New information about financial results is relevant for both shareholders and debt holders. If the results were anticipated, we would expect only a small reaction. We used the Lexis Nexis database to skim through 900+ articles about ING to find out which of these events were

anticipated by the market and found no evidence of information leakage of the IABF or the CEO change before 26 January 2009.

Prior to the announcement of the Q4, 2008 results, analysts from Rabo Securities had anticipated losses of € 1.9 billion (Financieel Dagblad, 2009) for Q4, 2008. The actual losses, at € 3.3 billion, were much bigger than anticipated (by 73.6%) and this undoubtedly had a negative impact on the stock returns. This means that the impact of the IABF was larger than the abnormal return calculated above. There is some literature that relates share price changes to the announcement of financial results. Perry & de Fontnouvelle (2005) find that market values fall one-for-one with operational losses caused by external events. We do not know what share of the unexpected loss should be classified as operational loss or as balance sheet losses due to impairments. Palmrose et al (2004) investigated share price reactions to restatements, and find that the response to balance sheet losses is smaller than the response to operational losses. Applying the method by Perry & de Fontnouvelle (2005), we make a rather strong assumption that all the full additional loss should be qualified as operational loss, and the result of this estimation should therefore be interpreted as an upper bound. First, we calculate the loss percentage, defined as the unexpected loss divided by the total equity value. We find a loss percentage of (3.3-1.9)/8.35 = 16.76 %, meaning that the abnormal return caused by an unexpected operational loss, without any confounding effects, should have been -16.76%. Again, we stress that this result is an upper bound, as it is unlikely that all of the unexpected loss can be ascribed to operational loss.

With respect to the change of CEO, we could not find evidence that the change was expected. Therefore, the information pertaining to the CEO changeover was included in the abnormal return. To isolate the impact of the IABF, we correct the abnormal return for the news of the CEO changeover. Other studies have analyzed stock price reactions to CEO changes at other firms, and we adopt the results of Dherment-Ferere & Renneboog (2002), who studied the share price reaction to CEO resignations in 207 listed French companies. They find that in case of a forced resignation, the cumulative abnormal return of an *internal* CEO promotion in a poorly performing firm drops by almost 1% on the day of the announcement, whereas the appointment of an *external* CEO results in an increase of over 2%. In case of a voluntary resignation, there is no significant change in the share price. We consider Jan Hommen to be an external CEO.

Although he was the chairman of the supervisory board before joining the executive board, he did not have prior line management responsibility at ING.

From the abnormal return found before, we subtract any abnormal return ascribed to the announcement of financial returns and CEO change: These two concurrent events partially cancel each other out. With a total number of 2,061,300,000 shares at a share price of € 4.0513, the market value of ING shares prior to the event was € 8.35 billion. We therefore find that the IABF has increased shareholder value by 23.96% * € 8.35 billion = **€ 2 billion**, cf Table 2 below.

Table 2: shareholder values

		%	Value (€ million)
Actual change in share price		+ 18.5%	1,545
Corrections:			
• Market returns AEX (MR = 6.2%, β=1.5)	+ 9.2%		
• Response to loss results (at most)	-16.76 %		
• Response to CEO changeover	+ 2 %		
Change in shareholder value attributable to IABF		+ 23.96 %	2,001

From the robustness checks discussed in section 6, we will see that the choice of benchmark index and the beta used has a substantial impact on what we measure as a abnormal return, but the key outcome of our exercises are not affected materially by any of the robustness checks.

Veronesi & Zingales (2010) consider the increase in value of both common and preferred equity. Since all preferred shares had been revoked in 2008, ING had no preferred shares from 2009 onwards (Stichting ING Aandelen, 2008). It is worth mentioning that following the € 10 billion capital injection in October 2008, the Dutch state owns ING securities of this notional value, and the value of this stake has now increased. As these securities are not traded and are not identical to traded securities, we cannot provide an estimate of their increase based on market prices, but since any increase in their value would have accrued to the state, it anyhow should be excluded from any measure of state aid.

4 Debt holder value created by the IABF

As banks are highly leveraged, the value of existing debt is very sensitive to the value of underlying assets. If a bank's assets are considered safer following an asset guarantee, we would expect the value of debt to increase. Since bond prices are generally not very liquid, we use prices of Credit Default Swaps (CDS)[6] as was done in Veronesi & Zingales (2010).

4.1 Methodology

The increase in value for bondholders is equal to the decrease of the net present value of insuring ING bonds with a CDS. The methodology used by Veronesi & Zingales (2010) is as follows. First, it follows from an arbitrage-free condition[7], that the market value of an ING bond plus the cost of insuring these bonds should equal the market value of a government bond:

(3) $$B + PV(CDS) = GB$$

B= market value corporate bond

GB = government bond

$PV(CDS) = \sum Q(t) * CDS(t)/10000 * D(t) * Z(t)$

t = number of years until longest maturity

Q(t) = probability of not defaulting up to time t

D(t) = amount of existing debt that will not have matured by year t

$Z(t) = \text{discount factor } 1/(1+r_f)^t$ where r_f is the risk-free rate

If the value of the government bond does not change during the event window, we have:

[6] A credit default swap is insurance against the default of an underlying security. The higher the risk of default, the higher the insurance premium, called 'spread'.

[7] There may have been violations of the arbitrage-free condition during the financial crises. We do not need the arbitrage-free condition to hold precisely, only that the magnitude of the deviation did not change during the event window.

(4) $$\Delta B = -\Delta PV(CDS)$$
$$= -\left(\sum Q1(t) * CDS1(t)/10000 * D(t) * Z(t) - \sum Q0(t) * CDS0(t)/10000 * D(t) * Z(t)\right)$$

where the subscript 1 indicates after the event and 0 indicates before the event. CDS premia are higher when the expected probability of default is higher. As we have CDS premia for different maturities, we can use this information to bootstrap out the implied yearly probability of default, p(t), which we then use to determine the probability of survival up to time t.

To find the values for p(t), we use a no-arbitrage formula for a CDS rate on a contract with maturity T:

(5) $$CDS(T) = \frac{(1-\partial)\int_0^T p(\tau) e^{-\int_0^\tau r(u)+p(u)du} d\tau}{\int_0^T e^{-\int_0^\tau r(u)+p(u)du} d\tau}$$

r(τ) = risk-free rate at time τ, obtained from swap rates data

p (τ) = risk-neutral default intensity for time τ

δ = recovery rate

If the default intensity is constant over time, the expression would simplify to CDS(T) = p(1-δ). Wbut w can find p (τ) for every τ by using the CDS rates for various maturities T. For simplicity, we follow Veronesi and Zingales (2010) in assuming that p (τ) is a step-function with a one-year step size. For the first year, the formula then simplifies to:

(6) $$CDS(1) = \frac{(1-\delta) p_1 \int_0^1 e^{-(r_1+p_1)\int_0^1 1 du} d\tau}{\int_0^1 e^{-(r_1+p_1)\int_0^1 1 du} d\tau} = (1-\delta) p_1$$

For the consecutive years we have (for derivations see the appendix):

(7)
$$CDS(T) = \frac{(1-\partial)\sum_{i=1}^{T} p(i)\frac{1}{r_i + p_i}[e^{-\sum_{t=1}^{i-1}(r_t+p_t)}(1-e^{-(r_t+p_t)})]}{\sum_{i=1}^{T}\frac{1}{r_i + p_i}[e^{-\sum_{t=1}^{i-1}(r_t+p_t)}(1-e^{-(r_t+p_t)})]}$$

Once we find all different p (τ), we can calculate the probability of survival up to time T as:

(8)
$$Q(T) = e^{-\int_0^T p(\tau)d\tau}$$

Assuming that p (τ) is a step-function we find:

(9)
$$Q(T) = e^{-\sum_{\tau=1}^{T} p(\tau)}$$

To control for general movements of CDS prices, we again use a difference-in-difference approach where we compare ING with a benchmark CDS Index. We subtract the change in insurance costs using the index from the actual change in insurance cost discussed earlier as follows:

(10)
$$\Delta_a \mathrm{PV(CDS)} = \Delta\mathrm{PV(CDS)} - \mathrm{PV}_0\mathrm{(CDS)}^* \frac{\Delta \mathrm{PV}^i(CDS)}{PV_0^i(CDS)}$$

The superscript *i* denotes the index.

4.2 Application

We use CDS spreads for ING senior and subordinated debt for maturities up to 5 years, obtained from Datastream. A further description of the data types selected can be found in the data description in the appendix.

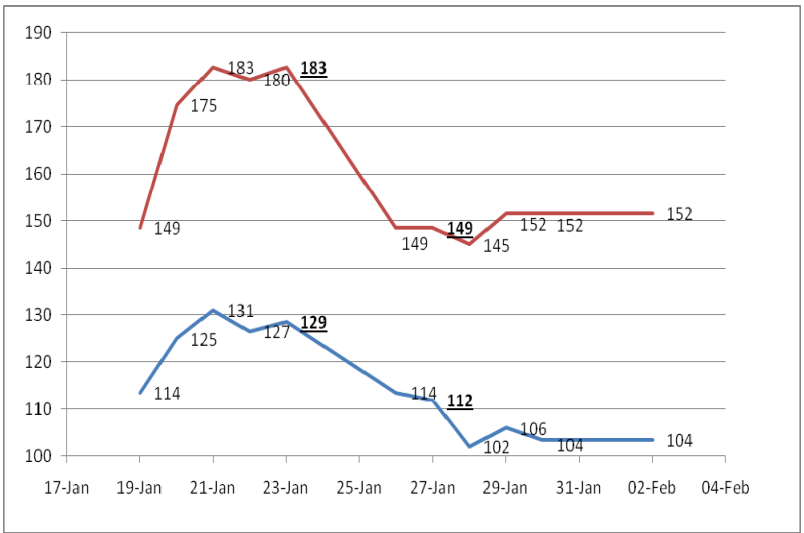


Fig.4: 5-yr CDS spreads, ING subordinated and senior debt

As expected, CDS prices for ING debt dropped following the announcement of the IABF. For illustrative purposes, we show a graph of 5-year CDS on

ING senior and subordinated debt; which is the most liquid contract type. As can be seen from Fig. 4, the CDS premia for subordinated debt are higher and more volatile than for senior debt. Credit default swaps for other maturities follow the same pattern as the 5-year contracts.

Bonds represent only a small part of ING's debt. The total amount of debt securities in issue at year-end 2008 was € 96 billion The vast majority of debt securities in issue have a maturity less than one year, and only 10% consists of debt paper with a maturity larger than 5 years. Details of the term structure of debt can be found in the appendix. We also take into account an amount of € 14 billion in 'other borrowed funds' (excluding loans from group companies), of which only 18% has a maturity larger than 5 years. This brings the total amount of senior debt included in our analysis to € 110 billion. For senior debt with a maturity over 5 years, we assume an average maturity of 10 years. The € 10 billion in subordinated loans consists of perpetual subordinated bonds only; we assume an average maturity of 20 years. We exclude liabilities to other banks, since they are of very short maturity and therefore not significantly affected. Similarly, we exclude customer deposits, since the vast majority is covered under the (generous) Dutch Deposit Insurance Scheme with a maximum of 100.000 Euro per deposit, so any increase in value flows back to the state through reduced valuation of the put option implicit in the deposit insurance scheme and so should be excluded from state aid calculations.

Using equ (7) and (9), the term-structure of CDS premia allows us to calculate risk-neutral survival probabilities, Q(t). These survival probabilities depend on an assumption about the recovery rate. Following Veronesi & Zingales (2010), we report our results for an intermediate value, 20%. The authors state that the historical average recovery rate of bonds is about 40%, but it declines to about 20% during recessions. In our robustness checks, we will also report values found using a recovery rate of 40% and 0%, the latter being the lower bound. Again, we use a 2-day event window, from Friday 23 January to Tuesday 27 January.

As in the previous chapter where we calculated the increase in shareholder value, we correct for general market movements. We use iTraxx Europe, a highly liquid CDS index. New indices are released by iTraxx two times per year, in March and September. We use the S10 series for Financials that was introduced in September 2008. During our event window, the iTraxx indices also went down, both the general iTraxx Europe and the sector index iTraxx Europe Financials. We use the iTraxx Europe Financials, as it is available for both senior and

subordinated debt, and for all maturities of 1-10 years. We report a summary of our results below. Detailed results are included in the appendix.

The results are interesting in that the im, act on debt values seems small, cwertainly substantially smaller than the impact on equity. The total adjusted value increase amounts to a relatively small amount (about 150 mE). Of course equity is junior to debt; apparently ING was sufficiently well capitalised to absorb pre-IABF uncertainty without it significantly effecting debt values.

Table3: Change in debt holder value (ΔB), in € million

	5-yr CDS spread 23 Jan	5-yr CDS spread 27 Jan	Raw decline	Debt amount	ΔB=-ΔPV	Market-adjusted ΔB=-ΔPV
ING senior debt	128.50	112.00	16.50	110,000	300	71
ING subordinated debt	182.75	148.50	34.25	10,000	243	82
Itraxx Eur Fin senior	127.49	116.86	10.63			
Itraxx Eur Fin sub	196.47	177.30	19.17			
				120,000	543	154

Contaminating events

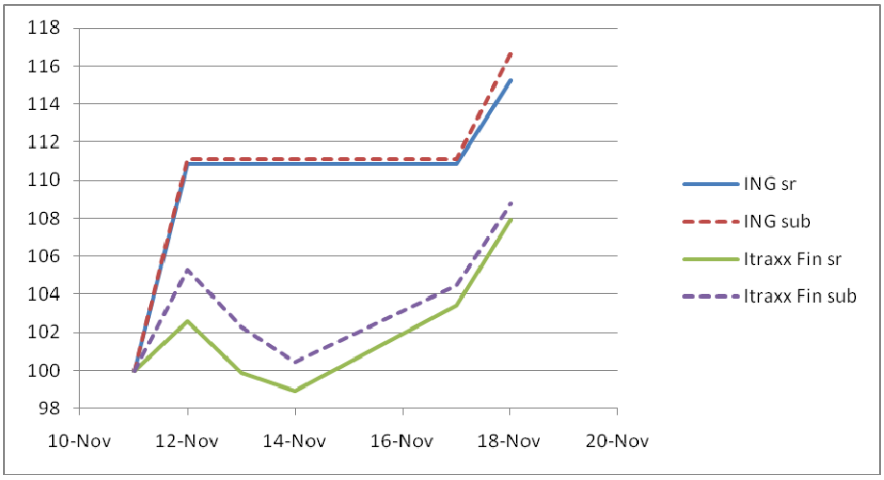
The gain in bondholder value that we have now calculated captures the impact on the CDS prices of all *unanticipated* events of 26 January. But the announcement of the IABF was not an isolated event, but it was 'contaminated' by two other events on the same day: the announcement of the financial results of the 4th quarter of 2008 and the announcement that CEO Michel Tilmant would step down to be replaced with Jan Hommen. If these concurrent events were *not* anticipated, then they are *included* in the abnormal return calculated above.

Shareholders will be affected by events that impact both profits and losses, whereas bondholders are mostly affected by events that impact losses and default risk. If a firm is profitable, bondholders will not benefit from even higher profits, but shareholders will. Therefore,

we expect the impact of the CEO changeover and the loss announcement to be more relevant for shareholders than for bondholders.

After the loss announcement of the Q3 2008 losses on Wednesday 12 November 2008 - the first in ING's history - CDS prices for both senior and subordinated debt increased by 11% on the same day, and remained at this level during the next 3 days, while the index remained more stable.

Fig.5: standardized 5-year CDS premia for ING and index



The loss announcement of 12 November 2008 was not confounded by other events. We could not find any literature for CDS price reactions to loss announcements. Anyhow, the impact on debt holder value[8] following a loss announcement should be much smaller than the impact on shareholder value as debt holders are senior to equity holders. If the bank is adequately capitalized to absorb all consequences in equity values alone, there should be no impact on debt values. so we have not made any correction to our estimate of debt value changes for the loss announcement. Making such a correction would at most have doubled our estimate of debt value increases, which would not have changed the conclusion that there was so significant increase in debt value attributable to the IABF.

5.2 Projection of cash flows between ING and the state

[8] as measured by a reduction in the present value of insuring debt with CDS

The Ministry of Finance's advisor Dynamic Credit used two scenarios: a base case and a stress case scenario, depending on projected house prices and unemployment figures. Under the base case scenario, the state would receive a positive cash flow in all years, adding up to $ 2.4 billion undiscounted in total. Adding a 3% equity premium as a risk factor to the long term interest rate on Dutch bonds still yields an expected discounted gain of 1.9 billion Euro. Under the stress scenario, there would be negative cash flows for the state in some years, adding up to a total loss of $ 792 million. (Ministry of Finance, 2009a). And discounted adding in a 3% risk premium yields an even smaller expected loss in NPV terms, of less than 400 mE.

In 2009, the net cash flow to the state was actually exactly 0, but this was due to technical reasons. In 2009, the cash flows from the RMBS portfolio were higher than foreseen, due to early reimbursements resulting from early reimbursement on the underlying mortgages. Early reimbursement creates an interest rate risk, and the state compensated for this risk by accelerated payment of the funding fee. The higher amount of funding fee in 2009 will be compensated by a lower funding fee in subsequent years. (Ministry of Finance, 2009c). Data for 2010 are not yet available, but to date there is no indication of realized losses for the Dutch state.

5 Robustness checks

Of course our results are sensitive to many of the assumptions made. To get some feel for the sensitivity of the results to various assumptions made we performed a series of robustness checks. We consider the calculations for shareholder value and debt holder value in turn.

6.1 shareholder value

Different betas:

Traditionally, we have defined beta as the slope of a regression line when the returns of an individual stock are regressed on the market returns. This is equivalent to the following formula: $\beta = cov(SR, MR) / var(MR)$; an alternative approach is suggested by Blume and is based on the premise that beta tends to move toward 1 over time, and is obtained as follows (Brigham & Daves, 2009):

(11) $$\beta_{adjusted} = 0.67 * \beta_{historical} + 0.35 * 1$$

We compare the results using both the unadjusted beta and the adjusted beta.

Furthermore, the returns for a company can be calculated using daily, weekly or monthly time periods, and the resulting estimates of beta will differ. Using daily returns will increase the number of observations in the regression, but it exposes the estimation process to a significant bias in beta estimates related to non-trading[9] days (see also Damodaran, homepage). Beta estimates are also sensitive to the number of observations used in the regression. With too few observations, the regression loses statistical power, but with too many, the "true" beta may have changed during the sample period. In practice, it is common to use either 4 to 5 years of monthly returns, or 1 to 2 years of weekly returns (Brigham & Daves, 2009).

Considering the fact that ING is heavily traded, we would expect that the return interval should not have a large impact. On the other hand, we expect that reducing the length of the estimation period will make a difference because, as Veronesi and Zingales (2010) indicate, during a crisis beta's generally increases. Using a higher beta will decrease the abnormal return.

The table below shows how beta changes when using different return intervals and lengths of the estimation period, using both the unadjusted and adjusted (Blume corrected) beta.

Table 5: Equity beta for different return intervals and estimation periods; Blume-adjusted beta between brackets.

	Return interval		
Estimation period (yrs)	monthly	weekly	daily
From Jan 2008 (1)	-	**1.50 (1.35)**	1.54 (1.38)
From Jan 2007 (2)	-	1.68 (1.47)	**1.70 (1.49)**
From Jan 2005 (4)	**1.36 (1.26)**	1.42 (1.30)	1.44 (1.31)
From Jan 2004 (5)	1.37 (1.27)	1.40 (1.29)	1.41 (1.29)

Indeed, we see that changing the length of the estimation period has a larger impact on beta then changing the return interval. Since beta clearly is not constant over time, we use an estimation period of one year, being the most recent year, and we use weekly returns to generate sufficient data points, in our base case beta. To test the sensitivity of our analysis, we calculate the market-

[9] Even if a stock is traded on working days only, Datastream will artificially create trading days on holidays. Datastream lists prices and returns for all weekdays. If one of these weekdays is a holiday, the quote from the previous day is repeated.

adjusted return for our preferred beta of 1.50, as well as for the lowest and highest beta found in the table above. We also report results based on Blume's adjusted beta in Table 6 below.

Table 6: Beta estimates and increases in shareholdervalue

Beta		Abnormal return		Market-adjusted increase in shareholder value (€ mln)	
$\beta^{historical}$	$\beta^{adjusted}$	$\beta^{historical}$	$\beta^{adjusted}$	$\beta^{historical}$	$\beta^{adjusted}$
1.36	1.26	10.1 %	10.7 %	840	891
1.50	1.35	9.2 %	10.1 %	768	843
1.70	1.49	7.9 %	9.2 %	663	772

The lowest beta is obtained by using a long estimation period of 4 years and monthly returns, this yields the highest abnormal returns. The market-adjusted increase in shareholder value does *not* include our correction for the loss announcement and the CEO changeover, as the corrections will have the same magnitude for all 6 cases (adding 14.76% or € 1233 million).

Different benchmarks:

The default benchmark for ING Group is the AEX index. This index contains only the 25 most traded stocks of the Amsterdam Stock Exchange and as such may not be a representative of the relevant market for most of the ING investors. Therefore, we also calculate the abnormal return using two alternative benchmarks:

- STOXX Europe Total Market Index, a benchmark index with approximately 950 components
- STOXX Europe TMI Financials, a subset of the above index, with approximately 215 components in the banking & insurance industry.

STOXX daily returns were downloaded directly from STOXX.com. Using STOXX as a benchmark, our beta's and abnormal returns change as follows (before correcting for the impact of the announcement of the financial results and CEO change). Because the STOXX website provides daily returns, the related beta has been based on the daily returns during the year 2008.

As can be seen from the table 6 below, the selection of the benchmark has a much larger impact on the abnormal return that is found than the choice of the estimation method for beta.

Table 7: Index returns and ING abnormal returns 23-27 January 2009 (2-day window)

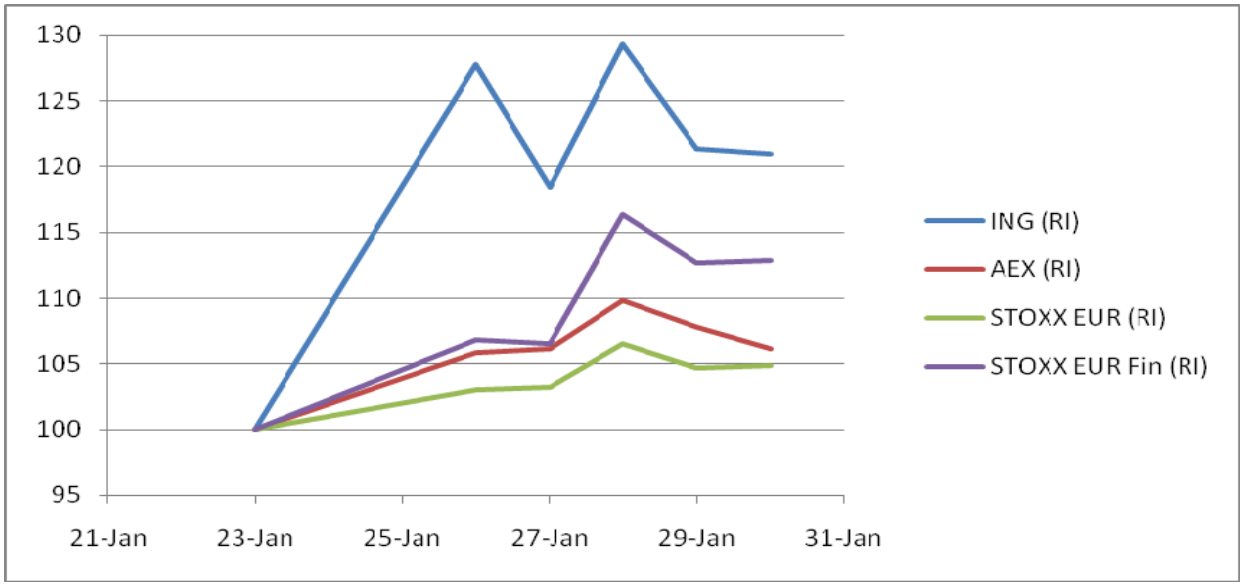
Security/ Index	Return	Beta		Abnormal return		Market-adjusted increase in shareholder value (€ mln)	
ING	18.5%	$\beta^{historical}$	$\beta^{adjusted}$	$\beta^{historical}$	$\beta^{adjusted}$	$\beta^{historical}$	$\beta^{adjusted}$
AEX	6.2 %	1.50	1.35	9.2 %	10.1%	768	843
STOXX Europe TMI	3.2 %	4.41	3.31	4.4 %	7.9%	364	659
STOXX Europe TMI Financials	6.5 %	3.18	2.48	-2.2 %	2.3%	-186	194

The market-adjusted return is highest when using the AEX as a benchmark, with an adjusted beta, and lowest when using STOXX Europe TMI Financials with the unadjusted beta as a benchmark. The market-adjusted increase in shareholder value calculated in this section does *not* include our correction for the loss announcement and the CEO changeover, as the corrections will have the same magnitude for all 6 cases (adding 14.76% or € 1233 million). Adding this amount, we find an increase in shareholder value ranging from € 1046 to € 2072 million.

Different event windows

In section 3, we used a two-day event window, from t-1 (Friday 23 January closing price) until t+1 (Tuesday 27 January closing price). During this window, ING's share price went up from 4.0513 to 4.7992, an increase of 18.5%. Following the argument by McWilliams and Siegel (1997), one could argue that the market responds *immediately* so that the event window could be reduced to one day (Friday 23 – Monday 26 January). Indeed, there was a sharp increase in the share price on the day of the announcement. ING share prices went up from 4.0513 to 5.1755 within the same day, an increase of 27.7%. Conversely, we could also argue that some overshooting could happen on the first day.

Fig. 6 Cumulative returns for different event windows



When comparing the ING shares to relevant indices, it is clear that the abnormal return will also be significantly higher when reducing the event window to one day, but slightly lower when extending it to 3 days or more. Figure 6 below shows cumulative returns for different event windows, standardized to 100 for Friday 23 January 2009.

Table 8 below shows that reducing the event window to one day increases the shareholder value by approximately € 800 million. Because of the obvious pattern of overshooting (cf fig. 6), we do however not think it is informative to use such a short event window.

Table 8: Index returns and ING abnormal returns 23-26 January 2009 (1-day window)

Security/ Index	Return	Beta		Abnormal return		Market-adjusted increase in shareholder value (€ mln)	
ING	27.7 %	$\beta^{historical}$	$\beta^{adjusted}$	$\beta^{historical}$	$\beta^{adjusted}$	$\beta^{historical}$	$\beta^{adjusted}$
AEX	5.9 %	1.50	1.35	18.9 %	19.8 %	1,582	1,653
STOXX Europe TMI	3.0 %	4.41	3.31	14.4 %	17.8 %	1,205	1,484
STOXX Europe TMI Financials	6.8 %	3.18	2.48	6.1%	10.8 %	506	904

6.2 debt holder value

Recovery rates

We follow Veronesi & Zingales (2010) in using a recovery rate of 20%. This rate is a mid-point between the standard default rate of 40% and the absolute minimum recovery of 0%. We can see from formula 4.6 - and it is also intuitive - that using a lower recovery rate in our calculations yields a lower implied probability of default, hence a higher implied survival probability Q(t). The survival probability in turn determines the present value (PV) of the cost of insuring debt using credit default swaps, as explained underneath formula 4.1. The decrease in this present value reflects the increase in bondholder value; - $\Delta PV = \Delta B$

The impact of the choice of recovery rate on the raw (or unadjusted) present value of insuring debt using CDS is relatively small, as can be seen in the table below. Results for the intermediate recovery rate of 20% were reported in section 4.2. We find the highest increase in debt holder value when assuming a recovery rate of 0.

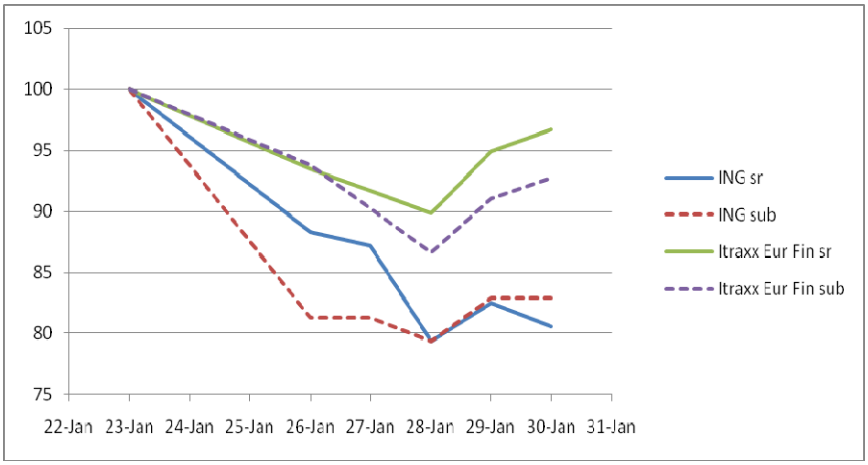
Table 9: raw and market-adjusted increase in debt holder value for different recovery rates; 2-day event window

€ million; recovery rates =>	δ=0	δ=0.2	δ=0.4
$\Delta B = - \Delta PV$	574	543	495
Market-adjusted $\Delta B = - \Delta PV$	168	154	132

Event window

In section 4, we used a two-day event window, from t-1 (Friday 23 January closing price) until t+1 (Tuesday 27 January closing price). During this window, CDS premia for ING senior and subordinated debt dropped by 12.8% and 18.8% respectively. We compare the CDS premia for ING debt to the Itraxx Europe Financials, and have standardized all premia to 100 for Friday 23 January 2009. From the below, it is clear that the drop in CDS premia for ING debt is much bigger than that for the European Financial sector in general.

Fig.7: standardized 5-year CDS premia for ING and Itraxx



When changing the event window, we can see that the CDS premia for ING senior debt continued to decrease after our 2-day window. We redo our calculations using a 1-day event window, and show the results for different recovery rates. Using a one-day event window, we find that despite the smaller drop in CDS premia, the reduction in the net present value of the insurance cost is actually bigger. This effect is caused by the higher implied survival probability Q(t).

Table 9: increase in debt holder value (amounts in € millions) for 1-day event window and different recovery rates

	δ=0	δ=0.2	δ=0.4
ΔB=-ΔPV	599	568	520
Market-adjusted ΔB=-ΔPV	55	40	18

For an event window of 2 days, we find the market-adjusted debt holder to be at least € 132 million (for a recovery rate of 40%) and at most € 168 million (for a 0 recovery rate). As we see no signs of overshooting, we could also consider using a 1-day event window, with a range of 18 to 50 million € for the different recovery rates assumed. Combining the two tables gives a range for the increase in debt holder value from € 18 million to € 168 million.

7 Conclusions

After the substantial capital support by the Dutch Government in October 2008 failed to calm financial markets, the Finance ministry intervened again late January 2009. The intervention was different from earlier approaches because it was explicitly based on an insurance model: only provide cash when it is really needed. Similar approaches had been tried in the US and the UK

earlier that month, but the Dutch approach was not quite of the same structure as those interventions. Rather than supplying a put option on (a segment of) the institutions portfolio in exchange of warrants on the bank shares, the Dutch approach involved a synthetic cashflow swap, swapping out (part of) ING's Alt-A based portfolio for a Dutch long term state bond. The swap was desigend carefully so as to leave adequate incentives with ING to manage the the risky portfolio properly by swapping out only 80% of the portfolio returns, leaving ING exposed to 20% of the original risk. The swap furhtermore involved a 10% discount on the face value of the portfolio.

That discount has become a bone of contention between the European Commission and ING. At issue is the amount of state aid involved. Was that discount too little given the assets transferred? Direct market prices were not available to answer this question: that is in fact what a liquidity crisis means: markets shut down and adequate price information about ABS based CDOs like the ones involved in this swap becomes unavailable.

The European Commission used information from market indices published at the time to assess the state aid content of the deal. We have taken an alternative approach, starting from the assumption that the liquidity crisis in markets for RMBS based CDOs implies that market indices lose information value. We investigated the increase in enterprise value that can be attributed to the IABF, as the insurance based intervention to support ING by the Dutch Government in january 2009 was called. That market information can be gleaned from markets that did not collapse, i.e. the markets in claims on the ING itself.

The objective of the IABF was to reduce the volatility of the future cash flows from the Alt-A RMBS portfolio, at low fiscal cost. In particular, the idea was to only transfer cash when it was needed: i.e. to provide insurance. And the insurance was directly focused on the main source of uncertainty, the substantial ING exposure to Alt-A risk through the investments in Alt-A mortgage based instruments by ING direct-USA.

The intervention would have been without taxpayer subsidy if the transfer price of the portfolio would have equalled the fundamental value of the Alt-A based portfolio. In that case, the cash flows passed on to the state by ING are equal, in risk-adjusted terms, to the cash flows ING receives from the (synthetic) government bond. This would be the case if the discount of 10% accurately reflected the discrepancy between the notional value and the fundamental value of the portfolio. But we cannot evaluate the fundamental value of the Alt-A portfolio directly,

because of the very liquidity crisis in markets for RMBS based instruments that caused the crisis to begin with. We therefore followed an indirect approach ut, since the tax payer subsidy/state aid, if any, would have accrued to the creditors and shareholders of the recipient of the aid, it is unavoidably smaller than the total increase in enterprise value. After all, a taxpayer subsidy larger than the increase in enterprise value would imply negative indirect effects of the intervention for the ING which is entirely implausible.

Combining the gains for both equity holders and debt holders, we find a market-adjusted increase in enterprise value of € 960 million. This increase includes the effect of three concurrent events: on the same day, ING announced the Q4, 2008 losses, a CEO change, and the IABF. To disentangle the three effects, we use results from t, using information about the value of claims on the ING, markets for which did not colaapse. The methodology used is based on Veronesi and Zingales (2010), extended for a series of particular events complicating the ING case. In particular we needed to correct for two other signifiacnt events taking place at the same time as the announcement of the IABF: the departure of the CEO and a profit warning (in fact an announcement of losses). We have derived the implicit assessment of the market's view on the amount of state aid involved in the transaction, based on the assumption that any increase in market value had to (A) reflect that state aid: and (B) reflect any type of spin-off on the rest of the balance sheet of the ING. Accordingly, the increase in amrket value of claims on ING is an upper limit on the amount of state aid involved.

Correcting for the profit warning/loss announcement and the CEO change over, we find a gain of at most **€ 2.2 billion** that can be attributed to the IABF. This is substantially below the EU estimate of 5 billion Euro. Of course our results depend on the assumptions and benchmarks used. Taking into account different possible choices for the benchmark index, beta, length of the event window, or recovery rate, our results are within the following range.

Table 10: range of estimates

Increase in value	Range
IABF-attributed increase in shareholder value	€ 1046 million to € 2072 million
For debtholders	€ 18 million to € 168 million
Total increase in enterprise value	€ 1064 million to € 2240 million

Thus even if we assume no positive spillover effects of the IABF on the overall assessment of the ING's balance sheet and interpret the entire increase in value to state aid received, we find a range of 1.1 b€ to 2.2. b€, substnatially below the EU's estimate of 5 b€. Thus the European Commission's estimate that the IABF entails € 5 billion of state aid is at variance with the assessment derived from market based evaluations. One has to conclude based on our market price based analysis, that the EC overestimated state support by a substantial margin.

Moreover, the fact that the intervention only had a significant impact on equity values and apparently not on debt values, supports the view of the Dutch authorities at the time that ING was sufficiently capitalized to absorb losses: at least the Alt-A correlated losses (given the impact of their reversal) seems to have affected equity values only in a significant manner.

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Appendix: data description, derivations and cash flow projections

Data used for this paper comes from a variety of sources: press release, annual reports, parliamentary documents and Datastream. In this section we indicate in more detail which data sources were used. We also show some derivations that are not shown in Veronesi & Zingales (2010).

A.1: Data used in calculating change in shareholder value (section 3)

All data used in section 3 comes from Datastream. In Datastream, the mnemonic for ING Groep is H: ING. For our calculations in section 3, we used the following data from Datastream:

RI – data type used for ING stock return and AEX index return
NOSH – number of shares

A return index (RI) is available in Datastream for individual equities and unit trusts. This shows a theoretical growth in value of a share holding over a specified period, assuming that dividends are re-invested to purchase additional units of an equity or unit trust at the closing price applicable on the ex-dividend date. For unit trusts, the closing bid price is used. Dividend payment data is available on Datastream from 1988 onwards. This enables a realistic method to be used in which the discrete quantity of dividend paid is added to the price on the ex-date of the payment. Then:

(1) $$\mathrm{RT_t} = RI_{t-1} * \frac{P_t}{P_{t-1}}$$

except when t = ex-date of the dividend payment D_t , then:

(2) $$\mathrm{RT_t} = RI_{t-1} * \frac{P_t + D_t}{P_{t-1}}$$

Where:

P_t = price on ex-date

P_{t-1} = price on previous day

D_t = dividend payment associated with ex-date *t*

Gross dividends are used where available and the calculation ignores tax and re-investment charges. Adjusted closing prices are used throughout to determine price index and hence return index. At this point the RI is calculated back to the base date.

A return index is also available for a range of sector and market indices, including Datastream Global Indices. The return index represents the theoretical aggregate growth in value of the constituents of the index. The index constituents are deemed to return an aggregate daily dividend which is included as an incremental amount to the daily change in price index. The calculation is as follows:

$$RI_t = RI_{t-1} * \frac{PI_t}{PI_{t-1}} * \left(1 + \frac{DY}{100 * n}\right)$$

Where:

RI_t = return index on day t

RI_{t-1} = return index on previous day

PI_t = price index on day t

PI_{t-1} = price index on previous day

DY = dividend yield of the price index

n = number of days in financial year (normally 260)

The number of shares in issue (NOSH) is the total number of ordinary shares that represent the capital of the company. The data type is expressed in thousands. For shares with more than one class of equity issue, (NOSH) is held separately for each issue. The amount is updated whenever new tranches of stock are issued or after capital changes.

The default benchmark for ING Group is the AEX index, available on Datastream under the mnemonic AMSTEOE. This index contains only the 25 most traded stocks of the Amsterdam Stock Exchange and as such may not be a representative of the relevant market for most of the ING investors.

Therefore, we also calculate the abnormal return using two alternative benchmarks:
- STOXX Europe Total Market Index, a benchmark index with approximately 950 components
- STOXX Europe TMI Financials, a subset of the above index, with approximately 215 components in the banking & insurance industry.

STOXX daily returns were downloaded directly from STOXX.com.

A.2: Derivation of default probability from CDS prices (section 4.1)

To find the values for Q(t), Veronesi & Zingales use a no-arbitrage formula for a CDS rate on a contract with maturity T:

$$CDS(T) = \frac{(1-\partial)\int_0^T p(\tau)e^{-\int_0^\tau r(u)+p(u)du} d\tau}{\int_0^T e^{-\int_0^\tau r(u)+p(u)du} d\tau} \quad (1)$$

Where:
r(τ) = risk-free rate at time τ, obtained from swap rates data – download from DNB website
p (τ) = risk-neutral default intensity for time τ
δ = recovery rate, default is 40%

If the default intensity is constant, then we simply have CDS(T) = p(1-δ)

We can find p (τ) for every τ by using the CDS rates for various maturities T. For simplicity, we follow Veronesi and Zingales in assuming that p (τ) is a step-function with a one-year step size. That gives for the first year:

$$CDS(1) = \frac{(1-\delta)p_1\int_0^1 e^{-(r_1+p_1)\int_0^1 1du} d\tau}{\int_0^1 e^{-(r_1+p_1)\int_0^1 1du} d\tau} = (1-\delta)p_1 \quad (2)$$

Before we write the formula for the second and consecutive years, we first simplify the notation:

$$CDS(T) = \frac{(1-\partial)\int_0^T p(\tau)g(\tau)d\tau}{\int_0^T g(\tau)d\tau} \tag{3}$$

Where

$$g(\tau) = e^{-\int_0^\tau r(p)+p(u)du}$$

and $-\log g(\tau) = \sum_{i=1}^{i-1}(r_i + p_i) + (t-i+1)(r_i + p_i)$ for $i-1 < t \le 1$

Since p (τ) is a step-function, we get:

$$CDS(T) = \frac{(1-\partial)\sum_{i=1}^{T} p(i)\int_{i-1}^{i} g(\tau)d\tau}{\sum_{i=1}^{T}\int_{i-1}^{i} g(\tau)d\tau} \tag{4}$$

The next step is to evaluate $\int_{i-1}^{i} g(\tau)d\tau$

$$\int_{i-1}^{i} g(\tau)d\tau = \int_{i-1}^{i} e^{-\{\sum_{t=1}^{i-1}(r_t+p_t)+(t-i+1)(r_i+p_i)\}}$$

$$= \frac{1}{r_i + p_i}\left(e^{-\sum_{t=1}^{i-1}(r_t+p_t)} - e^{-\sum_{t=1}^{i}(r_t+p_t)}\right) \tag{5}$$

Combining (4) and (5), we get:

$$CDS(T) = \frac{(1-\partial)\sum_{i=1}^{T} p(i)\frac{1}{r_i + p_i}(e^{-\sum_{t=1}^{i-1}(r_t+p_t)} - e^{-\sum_{t=1}^{i}(r_t+p_t)})}{\sum_{i=1}^{T}\frac{1}{r_i + p_i}(e^{-\sum_{t=1}^{i-1}(r_t+p_t)} - e^{-\sum_{t=1}^{i}(r_t+p_t)})} \quad (6)$$

Which we can rewrite as:

$$CDS(T) = \frac{(1-\partial)\sum_{i=1}^{T} p(i)\frac{1}{r_i + p_i}[e^{-\sum_{t=1}^{i-1}(r_t+p_t)}(1-e^{-(r_t+p_t)})]}{\sum_{i=1}^{T}\frac{1}{r_i + p_i}[e^{-\sum_{t=1}^{i-1}(r_t+p_t)}(1-e^{-(r_t+p_t)})]} \quad (7)$$

The CDS spreads are available from Datastream, as described in the next paragraph, and the interest rates (zero coupon rates) are available from the Dutch Central Bank[10]. This means we can now solve for p(t) using the fsolve function in Matlab.

A.3: Data types used for calculating change in bond holder value (section 4.2)

For our calculations in section 4, we used the CDS Premium Mid (BPM) for a variety of ING CDS contracts denominated in euros. The default data type in Datastream is Spread Mid (SM), which provides the mid rate spread between the entity and the relevant benchmark curve, expressed in basis points. Datastream provides data for approximately 40 different types of ING CDS contracts, depending on currency, maturity, seniority (senior or subordinated debt) and restructuring type used. The three most common restructuring types are[11]:

- Modified modified restructuring (MMR) is most common in Europe. It limits deliverable obligations after restructuring to bonds with a maturity < 60 months.
- Modified restructuring (MR) is most common in the United States. It limits deliverable obligations after restructuring to bonds with a maturity < 30 months.
- Credit restructuring (CR) is most common in Japan and emerging markets. It places no limit on obligations after restructuring.

[10] Table T1.3 at http://www.statistics.dnb.nl/index.cgi?lang=nl&todo=Rentes
[11] Source: posting 19 May 2009 on : http://kelloggfinance.wordpress.com/2008/09/18/credit-default-swap-update/

We restricted ourselves to euro-denominated CDS contracts, with restructuring type MMR, for different maturities, for both senior and subordinated debt. These contracts are generally available for maturities of 1-5, 7, 10, 20 and 30 years. Following Veronesi and Zingales, we restrict ourselves to maturities up to 5 years. This is justified because CDS prices are very similar for maturities of 5 years and more.

Series name	mnemonic
ING GROEP N.V. SNR MM 5Y E - CDS PREM. MID	ING5EAM
ING GROEP N.V. SUB MM 5Y E - CDS PREM. MID	ING5ESM

The number 5 in the mnemonic stands for the 5-year series. Changing the number obtains CDS premia for different maturities.

<u>iTraxx indices</u>

We use the iTraxx Europe Financials, as it is available for both senior and subordinated debt, and for all maturities of 1-10 years. New indices are released by iTraxx two times per year, in March and September. We use the S10 series for Financials that was introduced in September 2008. Data are obtained from Datastream.

Series name	mnemonic
CMA ITRAXX EU SEN FIN S10 SEN 5Y - CDS PREM. MID	ITESXS5
CMA ITRAXX EU SUB FIN S10 SUB 5Y - CDS PREM. MID	ITEUXU5

The number 5 in the mnemonic stands for the 5-year series. Changing the number obtains CDS premia for different maturities. For the 10-year series, the mnemonics are ITESXSX and ITEUXUX, respectively.

A.4: Calculation of default and survival probability

Subscript 0 denotes data prior to the intervention, and subscript 1 denotes data after the intervention.

Table A1: CDS rates senior debt and implied default/survival probabilities

Maturity (yrs)	CDS_0	CDS_1	p_0	p_1	Q_0	Q_1
1	134.5	124.0	0.0168	0.0155	0.9833	0.9846
2	132.0	119.0	0.0162	0.0142	0.9676	0.9707
3	129.5	114.0	0.0155	0.0129	0.9526	0.9582
4	129.0	113.0	0.0159	0.0137	0.9376	0.9452
5	128.5	112.0	0.0158	0.0134	0.9229	0.9326
6	128.5	112.0	0.0161	0.0140	0.9082	0.9196
7	128.5	112.0	0.0161	0.0140	0.8937	0.9068
8	128.5	112.0	0.0161	0.0140	0.8795	0.8942
9	128.5	112.0	0.0161	0.0140	0.8655	0.8818
10	128.5	112.0	0.0161	0.0140	0.8517	0.8695

Table A2: CDS rates subordinated debt and implied default/survival probabilities

Maturity (yrs)	CDS_0	CDS_1	p_0	p_1	Q_0	Q_1
1	153.4	164.7	0.0192	0.0206	0.9810	0.9796
2	162.5	158.0	0.0215	0.0189	0.9601	0.9613
3	169.1	151.2	0.0229	0.0171	0.9384	0.9450
4	175.9	149.9	0.0248	0.0182	0.9154	0.9280
5	182.8	148.5	0.0267	0.0178	0.8913	0.9116
6	182.8	148.5	0.0228	0.0186	0.8711	0.8948
7	182.8	148.5	0.0228	0.0186	0.8515	0.8784
8	182.8	148.5	0.0228	0.0186	0.8322	0.8622
9	182.8	148.5	0.0228	0.0186	0.8134	0.8464
10	182.8	148.5	0.0228	0.0186	0.7951	0.8308
11	182.8	148.5	0.0228	0.0186	0.7771	0.8155
12	182.8	148.5	0.0228	0.0186	0.7596	0.8005
13	182.8	148.5	0.0228	0.0186	0.7424	0.7858
14	182.8	148.5	0.0228	0.0186	0.7256	0.7714

15	182.8	148.5	0.0228	0.0186	0.7093	0.7572
16	182.8	148.5	0.0228	0.0186	0.6932	0.7432
17	182.8	148.5	0.0228	0.0186	0.6776	0.7296
18	182.8	148.5	0.0228	0.0186	0.6623	0.7162
19	182.8	148.5	0.0228	0.0186	0.6473	0.7030
20	182.8	148.5	0.0228	0.0186	0.6327	0.6901

A.5: ING balance sheet data

Table A3: ING balance sheet (amounts in millions of Euros)

EQUITY	
Shareholders' equity (parent)	17,334
Non-voting equity securities	10,000
	27,334
Minority interests	1,594
Total equity	28,928
LIABILITIES	
Preference shares	0
Subordinated loans	**10,281**
Debt securities in issue	**96,488**
Other borrowed funds	**31,198**
Insurance and investment contracts	240,790
Amounts due to banks	152,265
Customer deposits and other funds on deposit	522,783
Financial liabilities at fair value through profit and loss	
– trading liabilities	152,616
– non-trading derivatives	21,773
– designated as at fair value through profit and loss	14,009
Other liabilities	60,532
Total liabilities	1,302,735
Total equity and liabilities	1,331,663

Note: the non-voting equity was created following the capital injection in October 2008.

The subordinated loans consist of perpetual subordinated bonds. The vast majority of debt securities in issue concerns securities with a maturity less than one year, and only 10% consists of debt paper with a maturity larger than 5 years.

Fig. A.1: ING liabilities as of 31 December 2008

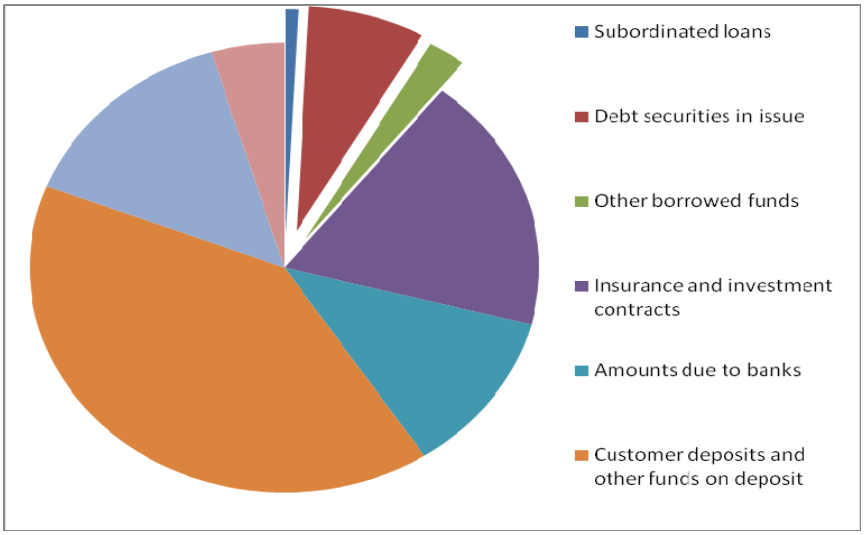

Table A4: Maturities of debt securities in issue

Fixed rate debt securities	
Within 1 year	50,994
More than 1 year but less than 2 years	2,448
More than 2 years but less than 3 years	2,410
More than 3 years but less than 4 years	2,429
More than 4 years but less than 5 years	4,332
More than 5 years	6,290
Total fixed rate debt securities	68,903
Floating rate debt securities	
Within 1 year	11,858
More than 1 year but less than 2 years	5,325
More than 2 years but less than 3 years	5,189
More than 3 years but less than 4 years	1,423
More than 4 years but less than 5 years	28
More than 5 years	3,762
Total floating rate debt securities	27,585
Total debt securities	96,488

Table A5: Other borrowed funds by remaining term

	2009	2010	2011	2012	2013	There after	Total
Subordinated loans of group companies	553	1,058	1,502	1,706	652	10,398	15,869
Preference shares of group companies						1,071	1,071
Loans contracted	**5,590**	**1,126**				**1,756**	**8,472**
Loans from credit institutions	**4,580**	**279**	**180**	**1**		**746**	**5,786**
	10,723	2,463	1,682	1,707	652	13,971	31,198

Using formula 4.3, we calculate the present value of insuring all outstanding debt before and after the intervention. The difference between the two, denoted -ΔPV, is the unadjusted gain to debt holders.

A.6: Raw and adjusted change in insurance costs (updated, small numerical changes)

Table A6: Present value of reduction in CDS 'insurance' cost of outstanding debt (in € million)

	PV_0	PV_1	ΔB = - Δ PV
senior debt	3,158	2,858	300
subordinated debt	2,065	1,823	243
total			**543**

Since we made some assumptions about the term structure of debt with a maturity longer than 5 years, we also report the results when considering only the decrease in the present value of CDS premia for debts with a maturity up to 5 years.

Table A7: Present value of reduction CDS 'insurance' cost of outstanding debt with maturity ≤ 5 years (in € million)

	PV_0	PV_1	ΔB = - Δ PV
senior debt	2,620	2,381	239
subordinated debt	748	696	53
total			**291**

As the iTraxx Financials index also decreased during the event window, we also find a reduction in insurance cost if we were to insure ING debt using the index.

Table A8: Present value of CDS 'insurance' cost of outstanding debt; using iTraxx Financials (in million €)

	PV_0	PV_1	$\Delta B = - \Delta PV$
senior debt	3,132	2,905	227
subordinated debt	2,254	2,079	175
total			**402**

If we limit our analysis to the first 5 years, we obtain:

Table A9: Present value of CDS 'insurance' cost of outstanding debt with maturity ≤ 5 using iTraxx Financials (in € million)

	PV_0	PV_1	$\Delta B = - \Delta PV$
senior debt	2,603	2,412	191
subordinated debt	886	805	82
			273

Finally, using formula (4.9), we find the *market-adjusted* gain to debt holders:

Table A10: Present value of market-adjusted reduction in CDS 'insurance' cost of outstanding debt (in € million)

	$\Delta B = - \Delta PV$
senior debt	71
subordinated debt	82
total	**154**

Since we made some assumptions about the term structure of debt with a maturity longer than 5 years, we also report the results when considering only the decrease in the present value of CDS premia for debts with a maturity up to 5 years.

Table A11: Present value of market-adjusted reduction CDS 'insurance' cost of outstanding debt with maturity ≤ 5 years (in € million)

	ΔB = - Δ PV
senior debt	46
subordinated debt	16
total	**30**

As we can see, most of the market-adjusted gain to debt holders is realized for debt with a maturity longer than 5 years

A.7: Projected cash flows between ING and Dutch state (section 2)

For the transaction, a discount of 10% on the nominal value was used, based on calculations by Dynamic Credit Partners, an external consultancy firm hired by the Ministry of Finance. The European Commission estimated the fundamental value at € 20.88 billion, basically agreing with DCP's assessment: this difference would imply a state aid amount of only € 720 million, negligible compared to ING's balance sheet.

Table A12: assessment (in € billions)

	Transaction	Ministry of Finance	European Commission
Nominal value	30		
80% of cash flows transferred to state	24		
Transfer price 90% of 80%	21.6	21.6	
Fundamental value of transferred cash flows		**21.6**	**20.88**
Market Value			16.6
State aid			5
Taxpayer costs		0	0.8

Nevertheless, the European Commission uses an estimate of the market value based on a general Alt-A based RMBS index, rather than the fundamental value to determine the implied level of state aid.

ILLIQUID ASSETS BACK-UP FACILITY

Annual Cash Flow Summary - Base Case (USD millions)

Year	Interest Received by State	Principal Received by State	Guarantee Fee Received by State	Interest Paid to ING	Principal Paid to ING	Management Fee to ING	Net Cash Flow to State
2009	1,194	4,188	56	785	4,214	130	310
2010	1,008	3,362	90	668	3,382	111	299
2011	865	2,812	94	575	2,829	95	272
2012	747	2,264	78	497	2,278	82	231
2013	647	1,909	66	434	1,921	72	195
2014	562	1,664	58	380	1,674	63	167
2015	490	1,478	52	333	1,487	55	145
2016	421	1,332	46	290	1,340	48	121
2017	358	1,172	41	252	1,179	42	98
2018	311	1,017	36	219	1,023	36	86
2019	271	900	32	190	905	32	76
2020	235	798	28	164	803	27	67
2021	203	709	25	142	713	23	59
2022	174	637	23	121	641	20	52
2023	148	555	20	103	558	17	45
2024	126	479	18	87	482	14	39
2025	107	422	16	74	425	12	34
2026	90	371	14	62	373	10	30
2027	75	326	13	51	328	8	26
2028	62	291	11	42	293	7	23
2029	50	255	10	34	256	6	19
2030	40	219	9	26	221	4	17
2031	31	190	8	20	191	3	14
2032	23	168	7	15	169	2	12
2033	16	143	6	10	144	2	10
2034	10	115	6	6	116	1	8
2035	6	81	5	3	81	1	6
2036	2	44	4	1	44	0	4
2037	1	9	3	0	9	0	3
2038	0	2	3	0	2	0	3
2039	0	2	3	0	2	0	3

The base case implies undiscounted projected cashflows with a NPV of plus 2.4 bE, or 1.9 bE using a discount rate of 5,5% (base rate of 2,5%, the Dutch LT debt rate at the time, plus a 3% risk premium).

The stress case implies projected cashflows with a negative NPV of only 382 mE using a discount rate of 5,5% (base rate of 2,5%, the Dutch LT debt rate at the time, plus a 3% risk premium). Undicounted, the net cashflow adds up to minus 792 mE.

ILLIQUID ASSETS BACK-UP FACILITY

Annual Cash Flow Summary - Stress Case (USD millions)

Year	Interest Received by State	Principal Received by State	Guarantee Fee Received by State	Interest Paid to ING	Principal Paid to ING	Management Fee to ING	Net Cash Flow to State
2009	1.189	4.146	56	785	4.214	115	278
2010	988	3.211	86	668	3.382	96	139
2011	828	2.596	88	575	2.829	82	28
2012	705	1.952	69	497	2.278	70	120-
2013	608	1.619	58	434	1.921	61	132-
2014	527	1.402	51	380	1.674	54	128-
2015	460	1.241	45	333	1.487	47	121-
2016	395	1.097	40	290	1.340	41	140-
2017	337	980	35	252	1.179	36	115-
2018	292	870	32	219	1.023	32	80-
2019	254	771	28	190	905	27	70-
2020	220	696	25	164	803	24	50-
2021	189	620	23	142	713	20	43-
2022	163	548	20	121	641	17	48-
2023	139	477	18	103	558	15	42-
2024	119	405	16	87	482	13	42-
2025	102	350	14	74	425	11	43-
2026	87	311	12	62	373	9	33-
2027	74	276	11	51	328	8	25-
2028	62	242	10	42	293	6	27-
2029	51	216	9	34	256	5	19-
2030	41	195	8	26	221	4	7-
2031	32	175	8	20	191	3	1
2032	25	157	7	15	169	2	3
2033	18	137	6	10	144	2	5
2034	12	113	6	6	116	1	8
2035	7	85	5	3	81	1	12
2036	2	50	4	1	44	0	11
2037	0	10	3	0	9	0	4
2038	0	1	3	0	2	0	2
2039	0	1	3	0	2	0	2