

**RÉPONSES DU DR. BOOTH À LA
DEMANDE DE RENSEIGNEMENTS N° 1 DE LA RÉGIE DE L'ÉNERGIE (LA RÉGIE)
RELATIVE À LA DEMANDE POUR LES TARIFS D'EMMAGASINAGE D'INTRAGAZ**

- 1. Références :** (i) Pièce C-ACIG-10, page 2;
(ii) Pièce C-ACIG-10, pages 10, 11 et 12.

Préambule :

(i) « *In terms of regulation I would support the continuation of an avoided cost approach, since there is no economic reason why Gaz Metro's ratepayers should pay higher costs than the market cost of storage operations.* »

(ii) « *In this respect it is important to note that it is regulation that follows the underlying economics, not vice versa. Gaz Metro is regulated, since it is the dominant gas distributor in Quebec and can always lower prices to deter any possible new entrant that wanted to duplicate its distribution pipes even were such entry allowed. Changing the regulation does not, in and of itself, change the underlying economics or the dangers for the abuse of a dominant position. This economic imperative is reflected in the statutes under which regulated companies operate, and the idea that firms are regulated to mimic the actions of a competitive firm and yet reap the scale economies of the natural monopolist.*

Although legal statutes differ marginally from one jurisdiction to another, they are similar to the regulations by which the Supreme Court of Canada came to determine a fair rate of return. In BC Electric Railway Co Ltd., vs. the Public Utilities Commission of BC et al ([1960] S.C.R. 837), the Supreme Court of Canada had to interpret the following statute:

(a) The Commission shall consider all matters which it deems proper as affecting the rate:

(b) The Commission shall have due regard, among other things, to the protection of the public interest from rates that are excessive as being more than a fair and reasonable charge for services of the nature and quality furnished by the public utility; and to giving to the public utility a fair and reasonable return upon the appraised value of the property of the public utility used, or prudently and reasonably acquired, to enable the public utility to furnish the service:

This statute articulated the "fair and reasonable" standard in terms of rates, and that the regulatory body should consider all matters that determine whether or not the resulting charges are "fair and reasonable." To an economist, "fair and reasonable" means minimum long run average cost, since these are the only costs which satisfy the economic imperative for regulation and by definition do not include unreasonable and unfair cost allocations. The statute also articulated the "prudently and reasonably acquired" test in terms of the assets included in the rate base.

The key point is that Intragaz does not have market power in the supply of storage facilities to Gaz Metro. My understanding is that under Section 49 of the Regie Act it has the power to set

tolls for Intragaz' service, but they must be fair and reasonable to customers, the regulated entity and be in the public interest. However, regulation does not necessarily mean cost of service regulation and the paramount motivation for regulation is to protect the customer. As mentioned previously the OEB Act allows forbearance, which essentially means the suspension of direct regulation. In the case of Ontario storage facilities, the OEB decided to regulate in-franchise storage on a cost of service basis, but allow new services to be unregulated. In this case the OEB followed the CRTC and the Telecommunications Act, where the CRTC decided that there was enough competition in the local and long distance telephone markets that it no longer made sense to regulate them using a cost of service methodology. The paramount criterion for the regulator is that entities are regulated since they have market power, once that market power is eroded and competition becomes viable there is no longer any public interest in cost of service regulation. Conversely, I find it difficult to see a public interest objective in taking a firm operating in a competitive market into cost of service regulation. Clearly, as a stand-alone entity this would not work since by definition cost of service regulation would be charging higher prices than exist in the competitive market and the company would lose revenues. It only works if the cost of service is included in the revenues of an affiliate, which is a dominant firm with market power and is itself regulated.

[...]

In my judgment if the Régie sees gains to a long term contract for Intragaz such that its revenues are recovered in Gaz Metro's rates as a "transportation by others (TBO) charge, then it should first reduce the starting rate base such that on its allowed ROE and common equity the revenue requirement is equivalent to avoided cost." » [nous soulignons]

Demandes :

1.1 À partir de la référence (ii), veuillez présenter votre estimation du «*minimum long run average cost*» pour Intragaz. Veuillez présenter vos hypothèses et fournir vos calculs.

1.1 In respect to reference (ii), please provide your estimate of the minimum long run average cost for Intragaz. Please provide your assumptions and supply your calculations.

Answer 1.1 Dr. Booth does not have the information necessary for this calculation. The reference to long run average cost is there since this is the tendency of a competitive market to price at long run average cost.

1.2 À partir de la référence (i) et (ii), veuillez présenter votre estimation du montant de réduction de la base de tarification qui serait approprié. Veuillez présenter vos hypothèses et fournir vos calculs.

1.2 In respect to references (i) and (ii), please provide your estimate of the reduction in rate base which would be appropriate. Please provide your assumptions and supply your calculations.

Answer 1.2 Dr. Booth would love to be able to make this estimate, but the necessary information is not available to him. His recommendation is simply that if the Régie agrees to cost of service regulation then consistent with prior practice for Intragaz he would recommend that the revenue requirement first be determined by avoided cost. Then the non financial costs should be deducted to leave the amount available to cover the financial costs. For example if this residual amount is \$10 million and the Régie determines the fair financial costs including depreciation, interest, taxes and net income to the shareholders to be 10% then the starting rate base should be set at \$100 million

2. Référence : Pièce C-ACIG-10, pages 21 et 22.

Préambule :

If Gaz Metro genuinely feels that Intragaz' assets have no useful life beyond year ten then they should be depreciated at a faster rate. If on the other hand it judges there to be a continuing need for both peaking and seasonal storage then it should sign a longer contract, which would allow the debt to be amortized over a longer period. Notably the Gannet Fleming depreciation study on page II-8 indicated that the normal useful life for storage assets similar to those of Intragaz is 50 years, but given the unique features of Saint Flavien they recommended the continued use of a 40 year life, regardless this is much longer than ten years. I would assume that Gannet Fleming in coming to this judgment discussed the issue with both Gaz Metro and Intragaz.

The upshot of these remarks is that I would expect the debt to be periodically refinanced, since the main problem is simply the amortization of the debt. In particular, I note an inherent conflict of interest with cost of service regulation when Gaz Metro is both an owner in Intragaz and its sole customer. The conflict of interest is simply that as the sole customer, Gaz Metro can sign only a short term contract, which makes Intragaz look "risky" due to the lack of financing, leading to a higher ROE and common equity ratio under cost of service regulation, which benefits Gaz Metro as part owner! I would therefore recommend that the Régie ignore any financing "problems" facing Intragaz if it decides to allow cost of service regulation. Instead, I would recommend that either Gaz Metro and GDF Quebec guarantee the debt of Intragaz, or that Gaz Metro itself finance Intragaz on the same terms that it itself borrows at. The latter option is the standard approach taken by many utility holding companies in Canada for their 100% owned affiliates. [nous soulignons]

Demandes :

2.1 À partir de la référence, veuillez indiquer la durée du contrat optimale compte tenu de vos hypothèses. Veuillez expliquer votre raisonnement.

2.1 In respect to the reference, please indicate the term of the optimal contract based on your assumptions. Please explain your reasoning.

Answer 2.1 If the Regie determines that Intragaz' assets are of strategic importance to Quebec, that is, there is value to having in franchise storage, Dr. Booth would see no reason why the term of the contract with Gaz Metro should not be for fifteen years, as requested in the past, or ten years. Dr. Booth would anticipate that over this period there is a significant possibility that shale gas assets in Quebec will be developed and that these storage assets may be of more significant strategic value in the future.

2.2 Veuillez fournir les exemples mentionnés à la référence à propos de l'approche standard voulant que la société-mère garantisse la dette de la filiale.

2.2 Please provide the examples (of utility holding companies) mentioned in the reference to the standard approach requiring that the holding company guarantee the debt of the affiliate.

Answer 2.2 The specific example Dr. Booth is thinking of is where Canadian Utilities Inc borrows debt at the CU Inc level and then mirrors down the cost of that debt to the operating subsidiaries like ATCO Electric, ATCO Pipelines and ATCO Gas. In this case the operating subsidiaries are not borrowing on the strength of their own regulated balance sheets, but the result is the same as if they did and then had the debt guaranteed by CU Inc.

2.3 Veuillez expliquer comment se ferait la détermination du coût de la dette d'Intragaz à partir du coût de la dette de Gaz Métro. Serait-ce le dernier taux de dette émise par Gaz Métro pour un terme de 10 ans ou une mise à jour annuelle du coût moyen de l'ensemble de la dette de Gaz Métro ?

2.3 Please explain how the cost of debt for Intragaz would be determined from the cost of debt of Gaz Metro? Would it be the last debt issued by Gaz Metro for a 10-year term or an annual update of the average cost of Gaz Metro's entire debt?

Answer 2.3 Dr. Booth would suggest that Intragaz be allowed Gaz Metro's embedded cost of debt. Although this is higher than Gaz Metro's current market cost of debt it is closer to the referenced quote for Intragaz debt of 5.75%, which seems to be a current rate for a non-investment grade issuer. This cost is also consistent with the original intent of Gaz Metro to develop these assets as standard rate base assets for Gaz Metro and should reduce administrative and regulatory costs.

Although this seems to generate a benefit to Gaz Metro, since it will borrow at its own current rate and then receive from Intragaz its embedded debt cost, this is not correct. This is because the rate base will then be reduced by higher financial charges as discussed in answer to 1.2 above. That is, it does not affect the revenue requirement, since that is assumed to be determined by avoided cost, but does lead to some simplifications in the regulation of Intragaz.

- 3. Références :**
- (i) Pièce C-ACIG-10, page 22;
 - (ii) Pièce C-ACIG-10, pages 72 à 74.

Préambule :

(i) « *I therefore would regard Intragaz assets as now virtually indistinguishable from other assets in Gaz Metro's rate base and would recommend the same 38.5% common equity ratio. Since Gaz Metro has a deemed 7.5% preferred share component I would allow 46% common equity for Intragaz which allows a minor increase over Gaz Metro.* »

(ii) « *As a small utility I would expect the Regie to regulate Intragaz infrequently. Consequently I would recommend either the use of an ROE adjustment mechanism or a fixed rate reviewable at the company or the Regie's discretion in the event of significant market changes.*

My recommended ROE formula is therefore as follows:

*$ROE = 7.50 + 0.50 * (Spread - 1.80\%) + 0.75 * (max(Forecast LTC Yield, 3.80\%) - 3.80\%)$*

[...]

I expect the formula produced ROE to increase with these interest rates and average out to the fixed rate of 8.25% over the term of the ten year contract with Gaz Metro. »

Demandes :

3.1 À partir des références (i) et (ii), veuillez indiquer si vous proposez 46 % de capitaux propres et à un taux de rendement de 7,5 % dans le cas où il y a une formule d'ajustement du taux de rendement ou 8,25 % dans le cas où le taux de rendement est fixe pour le contrat de 10 ans. Veuillez expliquer.

3.1 In respect to references (i) et (ii), please indicate if you are proposing 46% equity and a rate of return of 7.5% in the case where there is an adjustment formula for the rate of return or 8.25% in the case where the return is fixed for the 10-year term of the contract ? Please explain.

Answer 3.1 Dr. Booth judges both to be fair and reasonable.

Just as there is fixed rate debt in the market, there is also floating rate debt, where the rate fluctuates with changes in market conditions. If the Regie judges a fixed rate to be appropriate, given the regulatory costs attached to such a small company, then he would recommend that Intragaz be allowed a fixed ROE of 8.25%. Dr. Booth recommends ten year, but recognizes that most ROEs are reviewed on an approximate five year time table or when there are significant changes in the capital market. Alternatively, he recommends a starting ROE of 7.50% and then an adjustment mechanism. In his judgment interest rates will increase over the near term so that the allowed ROE will increase above the starting rate of 7.50%.

3.2 Veuillez présenter les avantages et les inconvénients de fixer un taux de rendement de l'avoir propre pour 10 ans.

3.2 Please provide the advantages and disadvantages of fixing a rate of return on equity for 10 years.

Answer 3.2 The major advantage of a fixed rate ROE is that it more closely matches the term of the interest charges on Intragaz debt. In this way for a normal utility, the interest coverage ratio is more predictable and there is more assurance for the bond holders that their debt costs will be covered. This effectively removes the problem of the last ten years that while the embedded debt cost for many utilities has come down only slowly, as debt has been rolled over at current interest rates, the allowed ROE has dropped with the fair rate of return. As a result, interest coverage ratios have been squeezed.

Whether this is a significant advantage for Intragaz depends on whether the Regie allows it to be financed according to Intragaz' application. With ten year amortising debt, the interest coverage ratio will automatically increase as the amount of debt is repaid and the debt ratio changes.

The disadvantage of fixed rate debt is that it gives a free "option" to the utility. If the fair ROE drops then the utility keeps the higher allowed ROE. However, if the fair ROE increases then the utility might request a hearing because its allowed ROE is below the current "fair" level. If the Regie accedes to this argument then effectively the utility gets "heads I can't lose and tails I can win" option with a fixed ROE. This is why it is important that if IntraGaz is allowed a fixed ROE then the decision states clearly that the ROE is expected to be fixed for a minimum, for example, five year period

- 4. Références :**
- (i) Pièce C-ACIG-10, pages 33,34 et 22;
 - (ii) Pièce C-ACIG-10, page 40;
 - (iii) Annexe A, Discours de Brian P. Sack de la banque fédérale de New York, vice-président exécutif, 2 décembre 2009, www.newyorkfed.org/newsevents/speeches/2009/sac091202.html

Préambule :

(i) « *Normally yields on long term Canada (LTC) bonds are not as affected by current monetary policy, since monetary policy works on the overnight rate and its influence weakens as the maturity of the bond increases. However, the current experience is not normal. The following graph shows that the LTC yield stayed at about 4.5% from 2005 until December 2007, when the Bank of Canada started to cut interest rates after which it stayed at around 4.0% until November 2008 when it dropped by 0.50%, as the market began to understand the severity of the recession and its implication for inflation. However, as these fears receded the LTC yield recovered to the 4.0% level it was at immediately prior to the financial crisis and the expectation in 2009/10 was that long Canada bond yields would increase as the economy recovered. However, in 2010 Q3 long term interest rates started to fall and this fall accelerated into Q4 2011 and has continued into 2012. Currently LTC yields are at 2.41% and barely compensate an investor for the purchasing power loss caused by 2% inflation let alone the tax bite on the nominal 2.41% interest. So for a taxable investor current LTC yields represent a negative real rate of return.* » [nous soulignons]

(ii) « *The RBC forecast was after the decision of the US Federal Reserve on September 13, 2012 to introduce a third round of quantitative easing (QE). The announcement had three 2 components:*

- *The Federal Funds rate will stay at 0.0-0.25% until Summer 2015, i.e., three more years;*
- *Operation Twist will continue indefinitely at about \$40 billion a month*
- *A new QE 3 will involve an additional \$45 billion a month in purchases of mortgage 6 backed securities.*

In total the Fed is committed to an indefinite purchase every month of \$85 billion of long dated securities to drive down long term interest rates and inject cash into the US economy through its bond buying program. This is unprecedented in the history of US monetary policy and will continue as long as there is need, that is, until the US unemployment rate comes back to closer to its natural non-accelerating inflation rate of unemployment (NAIRU) of 5.2%.

I would judge forecast LTC yields of 3.0% as well below any “equilibrium” yield, since they are only 1.0% above the forecast inflation rate and mean locking in a negative real yield for a typical taxable investor. This is an interest rate that is not made in Canada but reflects US and Eurozone problems.» [nous soulignons]

(iii) «A primary channel through which this effect takes place is by narrowing the risk premiums on the assets being purchased. By purchasing a particular asset, the Fed reduces the amount of the security that the private sector holds, displacing some investors and reducing the holdings of others. In order for investors to be willing to make those adjustments, the expected return on the security has to fall. Put differently, the purchases bid up the price of the asset and hence lower its yield. These effects would be expected to spill over into other assets that are similar in nature, to the extent that investors are willing to substitute between the assets. These patterns describe what researchers often refer to as the portfolio balance channel.» [nous soulignons]

Demandes :

- 4.1** À partir des références (i) et (ii), veuillez indiquer s’il y a des études sur la répression financière et ses impacts sur le taux sans risque, la prime de risque de marché, les rendements espérés des classes d’actifs, l’allocation d’un portefeuille, la valeur au marché des classes d’actifs y compris les actifs réglementés, le ratio valeur au marché/valeur aux livres, les résultats que produisent les modèles MÉAF et AFM et enfin la mesure de ces impacts en fonction de la durée de ces répressions financières. Si oui, veuillez les déposer et présenter les conclusions principales de ces études. Si non, veuillez présenter votre opinion sur ce sujet.

4.1 In respect to references (i) and (ii), please indicate if there are studies on financial crises and their impact on the risk free rate, the market risk premium, the returns expected by “classes” of assets, portfolio allocation, the market value of the “classes” of assets including regulated assets, the market to book value ratio, the results produced by the CAPM and DCF models and finally the measure of these impacts in terms of the length of the financial crisis. If so, please file them and present the main conclusions of these studies. If not, please provide your opinion on this subject.

Answer 4.2 Dr. Booth is not aware of any specific academic research that would support the Regie in this area.

Dr. Booth is aware that currently there is considerable discussion of the impact of “financial repression.” This is that to solve government debt problems the interest rate should be kept below the true market cost, so that debtors gain and creditors lose by the non-equilibrium interest rate. This is the basic way by which the US and the UK solved their huge debt problems

generated by deficit financing during the Second World War. The key references here are to Carmen Reinhart and Ken Rogoff, *This Time it is different: eight centuries of financial folly*, Princeton University Press, 2011. Ken Rogoff has a series of papers on this topic that can be downloaded at <http://www.economics.harvard.edu/faculty/rogoff>

Dr. Booth is also aware of a paper by Campbell Harvey and John Graham, *The Equity Risk premium in 2010* which suggests that the market risk premium closely tracks market volatility and credit spreads (consistent with Dr. Booth's credit spread adjustment). The paper can be downloaded at <http://www.duke.edu/~charvey>

The results of Rogoff support Dr. Booth's Operation Twist adjustment, while that of Harvey supports Dr. Booth's credit spread adjustment. In contrast the annual survey by Fernandez does not indicate a material change in the market risk premium (reported in Dr. Booth Appendix B).

4.2 À partir de la référence (iii), veuillez expliquer, d'une part, l'effet de ces interventions sur des actifs similaires dont certains sont non réglementés et d'autres sont réglementés et, d'autre part, l'effet sur les actifs réglementés si le régulateur tend à reproduire le rendement espéré durant des circonstances dites normales au lieu de ceux présentes dans le marché.

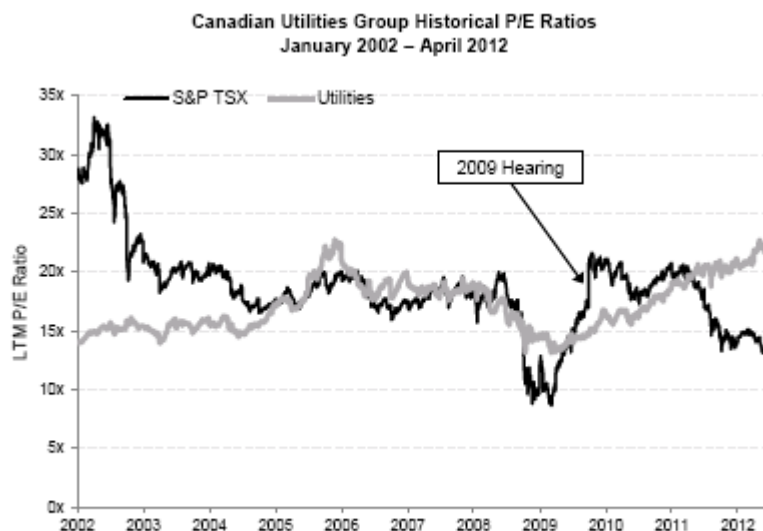
4.2 In respect to reference (iii), please explain, on the one hand, the effect of these interventions on similar assets some of which are non regulated and others regulated, and, on the other hand, the effect on regulated assets if the regulator tends to reproduce the return expected during so-called normal conditions instead of the return expected under the prevailing market conditions.

Answer 4.2 Please see Dr. Booth's Appendix C where the relevant passages are reproduced below (page 6on):

"RBC utility analyst Maureen Howe who commented that Canadian utilities are

"like convertible bonds. When interest rates are low, as they currently are, the companies trade on their bond value and are supported by tax-efficient dividend yields. When the 10-year GOC yield rises above 6%-6.5%, the Canadian companies trade on the basis of their underlying earnings and P/E."

Maureen Howe's observation is confirmed by the relative performance of the PE multiples for the TSX versus the Utilities as indicated in the following graph provided by Mr. Engen in answer to BCUC IR#1. 19.0.



The graph indicates that whereas the PE multiple of the TSX is weaker than in 2009 the very low interest rates have supported the valuations of the dividend rich utilities so that their PE ratios have increased utilities. This observation is consistent with Maureen Howe's observation that with low interest rates utilities trade on their "bond or fixed income value, in line with the observation that their cost of equity capital has declined."

The above passage indicates that utilities have downside protection from their significant income component (high dividend yields). This supports their stock prices when there is a financial crisis. The graph indicates that whereas the overall PE ratio for the TSX is historically low at 15X, that of the utilities is high at 25X, since the search for yield has boosted utility prices. Dr. Booth's judgment is therefore that the aftermath of the financial crisis and government intervention (particularly in the US and Europe) has had a different impact on utilities versus non-regulated assets. This is also reflected in the recent beta coefficients for utilities that have been unusually low, that is, they have not moved that closely with the equity market either in Canada or the US.

However, while there has been a differential impact of this intervention on regulated and non-regulated assets, what is important is the future path of events and future risk. Dr. Booth does not judge the impact of Operation Twist to be permanent and that market interest rates will return to equilibrium yields over the next few years. He also judges that the equity market, even for utilities, has not responded in the same way as the bond market. This is clear from the fact that dividend yields for high payers like the banks and utilities exceed the long Canada bond yield, which is a highly unusual state of affairs and reflects the fact that factors are driving the bond market that are not driving the equity market to the same degree.

The upshot from the previous remarks is that Dr. Booth judges 7.50% to be a fair return. If the Regie does not accept the Operation Twist adjustment and instead uses a standard CAPM approach and judges the fair ROE to be 6.7%, then the implicit PE ratio and market to book ratio will come down. If the Regie then accepts Dr. Booth's adjustment mechanism, without the long Canada yield forecast floor of 3.8%, the allowed ROE will increase as long Canada bond yields return to normal or equilibrium levels. In Dr. Booth's judgement this introduces un-needed volatility into IntraGaz' allowed ROE caused mainly by foreign capital flows into the Canadian government AAA bond market.

ANNEXE A

Brian P. Sack, Executive Vice President

Remarks at the Money Marketeers of New York University, New York City

As financial markets seized up last year and the economy sank to deeply negative growth rates, the Federal Reserve aggressively deployed a wide range of policy tools. It not only cut the federal funds rate all the way to its effective lower bound, but it turned to so-called unconventional monetary policy measures to stabilize the financial system and stimulate the economy.

These measures had dramatic implications for the Fed's balance sheet. Back in mid-2007, the Fed held a simple portfolio that included outright holdings of about \$800 billion of Treasury securities and relatively little else. As the use of unconventional policies intensified in the fall of last year, the balance sheet expanded quickly and included a broad array of assets and facilities. As one sign of this expansion, the statistical release summarizing the balance sheet, the H.4.1 release, expanded from four pages to twelve. The balance sheet today stands at around \$2.25 trillion, several times the size it was before the financial crisis.

As suggested by that massive increase, the Fed's balance sheet has moved to the forefront of its policy efforts. Accordingly, to understand the policy choices that lie ahead for the Federal Reserve, one has to understand how the balance sheet got to where it is and what effects it has had on financial markets. That will be the topic that I address in my remarks tonight. Before proceeding, I should note that the views I express here are my own and are not necessarily shared by the Federal Open Market Committee (FOMC) or other Federal Reserve staff members.

Evolution of the Balance Sheet

The initial expansion of our balance sheet was driven primarily by efforts taken to provide short-term funding to the markets. These facilities—including the Primary Dealer Credit Facility, the Term Auction Facility, the foreign-exchange swaps with other central banks, the Commercial Paper Funding Facility, and the various money market support facilities—were focused on extending credit at maturities of up to three months to various types of firms. These liquidity facilities were a key part of the government's efforts to restore stability to the financial sector. To be sure, they were only part of a broader policy response that had many important dimensions, as other efforts had to address the substantial capital needs of financial institutions and the considerable uncertainty that investors faced about the health of the financial system. But giving financial institutions greater confidence about their access to funding, and that of their counterparties, was a crucial step toward achieving stability. At this juncture, it is well appreciated that short-term funding markets are functioning much better and that liquidity pressures for most financial institutions have subsided.

I would argue that creating these liquidity facilities and implementing them was a lot harder than

exiting from them. In fact, the exit from these facilities to date has been fairly straightforward. Almost every facility was designed to provide a useful source of funding during stressed financial market conditions but to be an unattractive source of funding once markets returned toward more normal functioning. That structure has worked extremely well. Summing across these facilities, the total amount of credit extended has fallen from a peak level of \$1.5 trillion late last year to around \$160 billion today. We expect these balances to continue to decline over time, with many of the facilities set to expire on February 1.

With the liquidity facilities winding down, the composition of the Fed's balance sheet has shifted notably towards the assets acquired under the large-scale asset purchase programs, known inside the Fed as "LSAP" programs. The Fed is currently in the process of purchasing nearly \$1.75 trillion of Treasury, agency, and agency mortgage-backed securities through the LSAP programs. We have already completed our purchases of Treasury securities, totaling \$300 billion. And our purchases of agency securities and mortgage-backed securities (MBS) are well advanced. Indeed, we have completed purchases of \$155 billion of agency debt securities to date, out of a target level of \$175 billion, and of just over \$1 trillion of MBS, out of a target level of \$1.25 trillion.

With these purchases, we have a total of about \$1.8 trillion of Treasury, agency, and mortgage-backed securities on our balance sheet today. These holdings have been steadily increasing as the liquidity facilities have wound down. As a result, although the total size of our balance sheet has held relatively steady since the fourth quarter of last year, there has been a very important rotation taking place in its composition toward the assets purchased through the LSAP programs. As we complete the purchases scheduled through the first quarter of 2010, this component of the balance sheet will continue to grow, with the total amount of securities held projected to reach \$2.1 trillion.

Given the importance of these asset holdings in the current balance sheet, I will focus my remaining comments on them, addressing three broad questions. First, what were the intended effects of the asset purchases and were they achieved; second, will winding down the purchases cause an adverse reaction in markets; and third, how will policymakers manage to tighten financial conditions with the expanded balance sheet.

Intended Effects of Asset Purchases

The first question I consider is whether the asset purchases have had their intended effects. It is important to recognize that the LSAP programs differ from the Fed's liquidity policies in terms of their policy intent. The LSAPs were not aimed at supplying liquidity to financial institutions or at reducing systemic risk. Instead, they were intended to support economic activity by keeping longer-term private interest rates lower than they would otherwise be.

A primary channel through which this effect takes place is by narrowing the risk premiums on the

assets being purchased. By purchasing a particular asset, the Fed reduces the amount of the security that the private sector holds, displacing some investors and reducing the holdings of others. In order for investors to be willing to make those adjustments, the expected return on the security has to fall. Put differently, the purchases bid up the price of the asset and hence lower its yield. These effects would be expected to spill over into other assets that are similar in nature, to the extent that investors are willing to substitute between the assets. These patterns describe what researchers often refer to as the portfolio balance channel.

For Treasury securities, the reduction in yields would occur through narrowing the term premium, or the expected excess return that investors receive for their willingness to take duration risk. By removing a considerable amount of duration through its asset purchases, the Fed has kept the term premium narrower than it otherwise would have been. In addition, the purchases of mortgage-backed securities remove prepayment risk from the market. Investors generally find it challenging to hold the negative convexity of MBS associated with prepayment risk, and hence they demand an extra return to bear that risk, which keeps MBS rates higher than they would otherwise be. The removal of a considerable amount of this risk by the Fed's purchases would be expected to lower MBS rates by offsetting this effect. With lower prospective returns on Treasury securities and mortgage-backed securities, investors would naturally bid up the prices of other investments, including riskier assets such as corporate bonds and equities. These effects are all part of the portfolio balance channel.

In addition to the portfolio balance channel, Fed purchases could raise the price of a particular asset if it improved the liquidity of that instrument. That effect would presumably arise in situations in which trading flows were very one-sided and the Fed's purchases restored some balance to market dynamics. In those circumstances, the liquidity premium could fall if investors and dealers knew that they could unload that type of security in volume to the Federal Reserve at market prices.

Even if we understand the way that the LSAPs could have an effect on longer-term interest rates, actually quantifying that effect is a challenge. It is difficult to measure precisely the total effect of the LSAPs on longer-term interest rates, but I believe that the effect has been substantial. This can be seen in the movements in longer-term Treasury yields and MBS rates around the times of key announcements about asset purchases. It is also supported by other empirical research, including some regression models that the New York Fed staff has been developing. Taken together, those measures suggest that the effect of all LSAP programs on the 10-year Treasury yield could be as large as 50 basis points, though I reiterate that such estimates have considerable uncertainty surrounding them.

The effects on the MBS rate have been even larger. That can be seen most easily in the spread of yields on mortgage-backed securities over those on Treasuries, adjusted for the prepayment option embedded in those securities. The option-adjusted spread has narrowed by about 100 basis

points since the announcement of the program, with more than half of that decline occurring on days of substantive statements about the MBS purchase program.

How has the Fed been able to generate these substantial effects on longer-term interest rates? One word: size. The total amount of securities to be purchased under the LSAPs is quite large relative to the size of the relevant markets. That is particularly the case for mortgage-backed securities. Fed purchases to date have run at more than two *times* the net issuance of securities in this market. In the securities with 4 percent and 4.5 percent coupon rates, which have been among the most actively produced mortgage-backed securities since purchases began, the Fed has accumulated about two-thirds of the *total outstanding amount* of those issues. In other words, the Fed has been a substantial presence in these markets and has accordingly left a big footprint.

Another reason for the large impact on MBS rates, in particular, is that the market began from a point of substantial spreads—ones that were well above market norms. These wide spreads could have reflected poor liquidity and an elevated liquidity premium on these securities, or perhaps an extreme risk aversion to any asset containing the word “mortgage.” In either case, Fed purchases would have acted to narrow the premium, bringing MBS rates down by a disproportionate amount as the MBS spread returned to more normal levels.

As the purchase program has progressed, the MBS spread has fallen to levels that are narrower than its historical average, and the liquidity considerations have turned completely in the other direction. Indeed, one issue that the Open Market Desk at the New York Fed now faces is whether its purchases are so large that they *reduce* market liquidity. The program has to strike the right balance between being large enough to have a meaningful impact on rates, but not so large that it impairs market functioning. As just noted, the LSAPs appear to have been successful in generating an effect on rates, and we are also taking steps to try to limit the adverse effects on market liquidity.

Winding Down the Asset Purchases

The apparent success of the LSAP programs has a flip side, in that we must consider how market pricing will evolve during and after the termination of the programs. This brings me to the second question that I consider: Will markets have an adverse reaction as the Fed winds down its purchases?

One key issue in this regard is whether the market effects mentioned before arise from stock or flow effects. The portfolio balance effects discussed earlier would presumably be associated with changes in the expected *stock* of assets held by the public. Under this view, even an abrupt end to the Fed’s purchases, if fully anticipated, would not cause an adverse market response, as it would not represent a discrete jump in the outstanding stock of securities held by the public. However, we want to allow for the possibility that the *flow* of asset purchases, or the ongoing presence of the Fed as a significant buyer, may also be relevant for market pricing. In that case, the end of the

Fed's purchases could cause an increase in longer-term interest rates, at least temporarily until the market has had more of an opportunity to adjust to the Fed's absence.

On theoretical grounds, it would seem that the main impact of the Federal Reserve purchases reflects stock effects. However, flow effects could matter as well, particularly given the very large MBS purchases we have been making. The bottom line is that we cannot be absolutely sure about the degree to which market effects arise through one channel or the other.

For that reason, the FOMC has adopted a strategy of gradually tapering the size of asset purchases as the programs approach their end. This is a cautious approach. It should help to smooth out any possible market reaction associated with the flow of purchases, and yet it has no cost under a stock-based view. Tapering gives the market time for new investors (or perhaps previously displaced investors) to enter the MBS market in the place of Fed purchases. A tapering strategy was applied to our Treasury purchases with success, as the end of that program did not prompt any notable market response—exactly as we had hoped. However, tapering may be a more important consideration for the termination of the MBS program, given its larger relative size.

Related to this discussion, it is useful to note that exiting from LSAPs can involve a tension that is absent in the Fed's liquidity facilities discussed earlier. The liquidity facilities were established in response to considerable market strains that had caused the price of term liquidity to skyrocket. In responding, the Fed could be confident that it was pushing market rates toward levels that would be considered normal over the intermediate term. LSAPs, in contrast, could in practice push risk premiums *below* the levels that would be sustainable over the medium term. Doing so could still be an optimal approach, in terms of achieving macroeconomic outcomes, even if it requires that market pricing will eventually have to reverse.

That reversal would be relatively slow under the portfolio balance theory, if the Fed were to allow its asset holdings to passively run off as they mature. As normal market issuance patterns proceed and as the assets purchased by the Fed mature, the market portfolio will gradually revert back to where it would have otherwise been, allowing risk premiums to gradually renormalize.

Tightening Financial Conditions with an Expanded Balance Sheet

Of course, reducing, and ultimately ceasing, our purchases is only one dimension of exiting from the LSAP programs. The other challenge that the programs pose is that they have injected large amounts of reserves into the banking system in a persistent manner. Thus, the final question I consider is how policymakers will manage to tighten financial conditions, when deemed appropriate, with the expanded balance sheet.

The banking system currently has more than \$1 trillion in reserves. These reserves are the liability on the Fed's balance sheet that corresponds to the aggressive expansion of its asset holdings. The balance sheet is still growing and, absent asset sales, will remain unusually large for years. These balance sheet dynamics, left on their own, would keep reserve balances high for some time,

potentially complicating the Fed's efforts to tighten monetary policy when appropriate.

Based on this consideration, it is not surprising that the Federal Reserve has been dedicating extensive effort to developing the framework and tools that could be used to tighten monetary policy even with a large balance sheet. This is a topic that is frequently discussed by FOMC members in their public speeches and in other communications.

A key part of the framework is the ability to pay interest on excess reserves. This authority alone may allow the FOMC to control short-term interest rates to its satisfaction, even if the banking system is saturated with a large amount of excess reserves. Indeed, the interest rate on excess reserves should act as a magnet for other short-term interest rates, keeping them relatively close together. In the current environment, the federal funds rate has remained modestly below the rate paid on reserves, typically by 10 to 15 basis points. If that spread were to remain steady near those levels even as the interest rate on excess reserves was increased, then policymakers would have sufficient control over short-term interest rates without the use of additional instruments. They could still choose a target level of the federal funds rate and could hit it by adjusting the interest rate on excess reserves.

However, policymakers face some uncertainty about how stable that spread will remain as short-term interest rates increase. The behavior of the spread today might not be that informative in this regard, as the proximity of short-term interest rates to the zero bound prevents the spread from getting much larger. In my view, the most likely outcome is that the spread will not widen substantially as short-term interest rates increase. However, if the spread does become large and variable, then policymakers will need other tools for strengthening their control of short-term interest rates.

With that in mind, monetary policymakers have asked the Federal Reserve staff to develop the ability to offer term deposits to depository institutions and to conduct reverse repos with other firms. These tools are similar in nature, as they both absorb excess reserves by replacing them with a term investment at the Fed. By removing reserves that would have otherwise been available for overnight lending, these tools could pull the federal funds rate and other short-term interest rates up toward the interest rate on excess reserves, providing the Fed with more effective control over the policy rate.

The development of both of these tools has made considerable progress. As indicated in the recent statement from the New York Fed, the Open Market Desk will soon begin conducting a series of small-scale, real-value term reverse repo transactions as part of our efforts to ensure the readiness of this tool. With the successful completion of those transactions, we will have achieved the operational ability to do term reverse repos with primary dealers against Treasury and agency debt collateral, using the triparty system for settlement. In addition, we continue to work on our ability to use MBS collateral in these operations and on a potential expansion of the set of our

counterparties. At the same time, the staff is actively working on the Term Deposit Facility. The FOMC has said that it views completing the operational work necessary to establish these tools as an important near-term objective.

It is important to underscore that market participants should not confuse the efforts to achieve operational readiness of these tools with a change in the stance of monetary policy. The mandate handed to the staff by the FOMC was to develop the tools in order to have them ready when needed, with no clear direction on when that time will come. At this point, our efforts are simply aimed at meeting that mandate.

Of course, building the tools is only half the battle. Determining how to use them properly will be at least as challenging.

In that regard, it is useful to consider what these tools can achieve and what they cannot. As noted earlier, draining reserves with these tools could help to improve our control of short-term interest rates, which is the critical issue for ensuring that policymakers can tighten financial conditions when necessary. However, draining reserves with these tools does *not* undo the portfolio balance effects of the LSAPs. These operations would basically substitute one short-term, risk-free asset for another—replacing what is in effect an overnight loan to the Federal Reserve (reserves) with another short-term loan to the Fed (a reverse repo or term deposit). It is hard to believe that the willingness of an investor to hold risky assets or of a bank to make risky loans would be affected in any meaningful way by this substitution between such similar assets.

A key issue here is whether reserves have some special importance for the availability of credit. Some market observers have a very reserve-focused perspective on the transmission mechanism of monetary policy, arguing that high reserve balances inevitably lead to rapid credit expansion. Under that view, the large-scale asset purchases provide stimulus to the economy primarily by supplying reserves to the banking system, in which case the stimulative effects could be unwound by draining the reserves using any of the tools available. My own perspective differs. In my view, the effects of the asset purchases arise primarily from the removal of duration and prepayment risk from the markets, based on the portfolio-balance effects discussed earlier. Those effects would not be unwound by draining reserves with reverse repos or term deposits.

This is an important consideration for anyone who believes that the portfolio-balance effects could turn out to be too powerful. Some market observers have expressed concerns that the large holdings of liquid assets “on the sidelines” are pushing up risky asset prices excessively as investors attempt to invest those funds. Taking out the excess reserves using the two instruments I discussed will not, by itself, reduce the amount of liquid assets and hence will not undo those effects.

Nevertheless, as long as the FOMC has control of short-term interest rates, it will be able to achieve the desired outcome for broader financial conditions. In particular, the FOMC could always raise short-term interest rates further than would otherwise be the case to offset the stimulus provided by the remaining portfolio balance effects coming from the LSAPs. This type of response is built into the current policymaking process, as any remaining portfolio-balance effects would presumably be factored into the FOMC's assumptions about how financial conditions are likely to evolve, affecting the FOMC's economic forecast and the policy decisions based on that forecast. In some sense, this approach places more of the burden on hiking short-term interest rates to tighten financial conditions when the time comes.

An alternative approach would be to reverse a portion of the portfolio-balance effects through asset sales. Asset sales would put the portfolio risk back into the market at a faster pace than redemptions alone, forcing risk premiums to adjust more quickly in order to entice investors to hold that risk. The result would be to put upward pressure on Treasury yields and MBS rates independent of any changes in the expected path of short-term interest rates, so that less of the burden of financial tightening would fall on the short-term interest rate. As described in the minutes of the last FOMC meeting, FOMC participants discussed the possible role of asset sales in their policy strategy going forward and expressed a range of views. My comments are intended only to lay out what I see as the conceptual difference between the effects of asset sales and short-term reserve draining operations.

Conclusions

Overall, the large-scale asset purchases that the Federal Reserve has employed seem to have had their desired effects in terms of reducing longer-term interest rates. These purchases have been an important part of the policy response that the FOMC put in place to foster a sustained economic recovery. Moreover, that conclusion is reassuring for the future, as it suggests that central banks will still have effective policy options should the zero bound threaten again.

However, these asset purchases have ongoing implications for the balance sheet that may require adjustments along other dimensions, such as the implementation of reverse repos, term deposits, asset sales, or other measures. The size, likelihood, and timing of the appropriate adjustments will only become apparent over time, as they will depend on the evolution of the economy and financial markets. They will also depend importantly on the effectiveness of interest on reserves for controlling short-term interest rates in a high reserve environment—a policy regime that has not been fully tested in U.S. markets and that will have to be evaluated in real time.

However, at this point we can at least identify what the policy issues are and evaluate how this set of tools addresses them. I have tried to provide you with my own perspectives on the effects that the Fed's expanded balance sheet has had on financial markets and the key issues that we face in

managing this balance sheet going forward. Hopefully these views will be of some use in assessing and evaluating the future decisions of policymakers and in predicting how financial markets may respond.

Thank you.