

### **Israel: Selected Issues**

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## ISRAEL

### **Selected Issues**

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Approved by European Department

December 21, 2010

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## **I. WHY WAS ISRAEL SO LITTLE AFFECTED BY THE GREAT RECESSION?<sup>1</sup>**

### **A. Economic Structure**

1. In the decade to 2007, Israel had secured strong stable growth—averaging 3.8 percent, with inflation in the 1–3 percent range, public debt falling below 80 percent of GDP, budget deficits declining into the 1–3 percent range, external current account surpluses, and the shekel freely floating and competitive (Figure 1). The economy was open and flexible—reflected in exports of some 40 percent of GDP, significantly oriented towards advanced economies. Property markets were stable, capped by earlier supply overhangs. Financial—and especially banking—supervisory structures were, by global pre-crisis standards, highly activist and effective.

### **B. The Nature of the Global Shock**

2. The seizure of global financial markets led to sharp falls in global spending on consumption (especially of durable goods) and investment goods, and to inventory decumulation. It also led to steep declines in global commodity prices and surges in capital flows seeking “safe havens.” On all counts, Israel was well positioned to withstand the shocks: strong supervision shielded its banks; durable and investment goods are minor components of its output; as an energy importer, its terms of trade strengthened by 13 percent in H1 2009. And the worst of the global shock was relatively brief. For all these reasons, Israel became—somewhat atypically—a safe-haven for investors, notably for residents.

### **C. The Policy Response**

3. Though the shock was less severe than elsewhere, the policy response—in accord with staff advice—was no less prompt or extensive. The policy rate of the Bank of Israel was lowered from 4 to ½ a percent promptly. Liquidity was injected by a modest program of BoI purchases of government bonds, and safe-haven capital inflows were absorbed by heavy pre-programmed forex intervention. In addition, various “unconventional” stabilization measures for the financial sector were implemented, including clarification of Israel’s longstanding implicit public guarantee for banks (See Box 2, Country Report No. 10/23). At the same time, automatic fiscal stabilizers—almost entirely on the revenue side—were largely accommodated, and the budget deficit grew from 2 percent of GDP in 2008, to 4½ percent in 2009. To anchor long-term fiscal expectations on sustainability, a new medium-term fiscal rule was adopted (See Section II below).

4. This overall package was supported by the announcement (in June 2009) that the “U.S. Israel Loan Guarantee Commitment Agreement” would be continued.<sup>2</sup> And in May 2010, Israel joined the OECD.

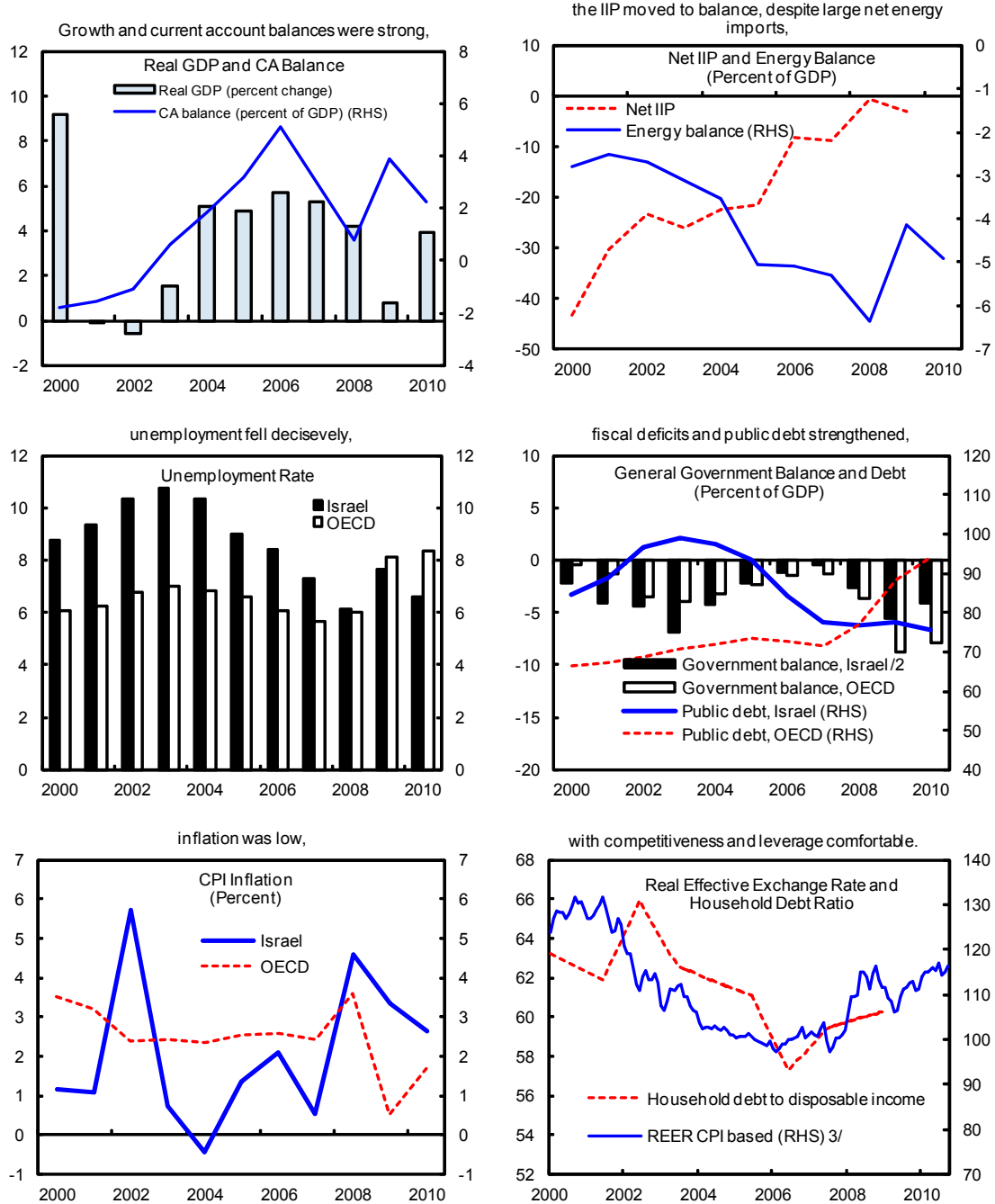
5. Once output growth had resumed, these short-term measures were put into reverse—with some of them, including BoI government bond purchases and preprogrammed forex intervention, cancelled.

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<sup>1</sup> Prepared by Nina Budina (FAD), Marco Cipriani (INS), and Scott Roger (MCM).

<sup>2</sup> This framework originated in 2003, and under its extension, new US guarantees of \$330 million will be available each year in FY2010 and FY2011, subject to agreed conditions and deductions. These amounts sum to some 10 percent of annual gross financing need for 2010.

Figure 1. Israel: Well Prepared, 2000–10 1/  
Prior to the Great Recession



Sources: Haver Analytics; IMF's International Financial Statistics; INS; World Economic Outlook; and IMF staff projections.

1/ Projections for 2010.

2/ Data on accrual basis.

3/ Index 2000=100, as of September 2010.

## II. FISCAL AND MONETARY FRAMEWORKS<sup>1</sup>

### Framework for Fiscal policy—New Fiscal Rules

1. The Deficit Reduction and Budgetary Expenditure Limitation Laws 2010 set limits on the path for the central government deficit (falling from 6 percent in 2009 to 1 percent from 2014 onwards), and on the annual growth of real central government spending over the same period. The latter sets spending growth as a function of public debt—rising, as the gap falls between debt and its 60 percent of GDP target; and rising with trend GDP—measured as a 10 year moving average—and with projected inflation. This formula caps real spending growth in 2011 at 2.6 percent. Of the two rules, the deficit ceiling path takes precedence; spending will be held below the formula level if necessary to secure the deficit path. Alongside, the 2009–10 budgets established that marginal tax rates for individual and corporate income tax rates would decline annually to 2016. Revenue losses from this would be at least partially offset through base broadening.

### Assessment

2. The deficit and spending rules reflect an appropriate premium on reducing public debt and, for the first time, establish 60 percent of GDP as the formal medium-term anchor. In their motivation, multiple-target structure, and parsimony, Israel's rules broadly echo those elsewhere. The motivation for such rules usually range either from a desire to lower public debt (as in Israel's case), or to address common pool problems, better control demand management, and meet ageing-related concerns (as in other countries with such rules). As elsewhere, a combination of indicators is typical, in part because single rules cannot address tax, spending, and debt parameters. Finally, for parsimony and to avoid over-determination, most rules frameworks leave a residual discretionary element—the aggregate revenue ratio in Israel's case.

3. However, the implications for expenditure are stark. The tax, deficit, and spending rules imply falls of some 2 percentage points of GDP in expenditure ratios between 2010 and 2015, on top of the falls of 5 percentage points in the past five years. But this understates the task because the sum of existing detailed medium-term spending commitments exceeds the 2015 target by some 2 percentage points of GDP. Adverse growth shocks could increase these tensions. With non-defense spending ratios already well below OECD averages, it raises issues of advisability—because social spending is likely to bear the brunt—and credibility. In any event, debt reduction should not be sacrificed to efforts to reconcile competing ambitions for tax reductions and spending increases.

4. Furthermore, OECD countries typically embed rules in comprehensive institutional arrangements—fiscal responsibility laws, full-fledged medium-term fiscal and expenditure frameworks—with well-defined escape clauses, transparency, and accountability

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<sup>1</sup> Prepared by Nina Budina (FAD) and Scott Roger (MCM).

frameworks. This is an area where Israeli arrangements could be strengthened. Steps could include: institutional improvements to support the implementation of medium-term expenditure frameworks beyond the two year budget, notably development of 2 or 3 years of rolling forecasts cast in nominal terms, using a moderately adverse medium term macro scenario as the basis to derive the expenditure envelope, and establishing medium-term prioritization mechanisms to ensure discipline over sectoral spending commitments and high quality of public spending (See SEI IV). Institutional improvements to enhance disclosure and management of fiscal risks could further enhance the credibility of fiscal rules and ensure aggregate fiscal discipline.

### **Framework for Monetary Policy—The new Bank of Israel Law**

5. Building on earlier de facto practice, the 2010 BoI law explicitly establishes price stability as the primary policy objective, and reflects much best practice for inflation targeting central banks including:

- An explicit target for CPI inflation within a tolerance range, with both to be determined by the government in consultation with the BoI. Specific reporting and accountability arrangements are set out for misses of the range;
- Operational autonomy for the BoI;
- A Monetary Policy Committee (MPC) to replace the Governor as the sole decision maker;
- Appropriate eligibility criteria for MPC members and steps to shield them from potential conflicts of interest or other external pressures;
- Explicit budget arrangements for the BoI and its sharing of profits with the government, with budgets reviewed by the Knesset.
- High standards of policy transparency and accountability, including through the requirements to announce changes in policy settings, publish MPC minutes, and issue monetary policy reports.

6. These represent important advances, codifying much precedent, and reinforcing confidence in the stability of inflation and the monetary policy regime.

7. Building on these foundations, further steps may be considered:

- Once the new system has bedded down, the Government and BoI could consider whether there may be benefit from clarifying the considerations that would enter into modifications to the inflation targets, possibly following precedents on this from New Zealand and Canada;
- Similarly, given that the law provides for MoF control of BoI salaries and profits distribution, there may be a case to consider whether understandings should be

reached between the Government and BoI regarding (i) the expected relationship between BoI and other public sector or financial sector wages and salaries; and (ii) arrangements for recapitalization of the BoI. In the event of capital losses would provide reassurance that these arrangements will support BoI operational independence.

8. Although the BoI law clarifies decision-making arrangements and accountabilities with regard to monetary policy, there is no comparable clarification of decision-making arrangements and accountabilities regarding the BoI's responsibility for macroprudential matters. These could usefully be clarified.



### III. GLOBAL RISKS AND DOMESTIC MACROFINANCIAL POLICIES IN ISRAEL<sup>1</sup>

#### A. Introduction

1. The Israeli economy emerged relatively unscathed from the global financial crisis, with growth resuming briskly in 2010 and unemployment almost at all-time lows. Nevertheless, its openness and high-level of integration to international financial markets make Israel vulnerable to the macro-financial risks present in the world economy. This attachment focuses on how the risks from the global economy should inform macro-financial policies in Israel.

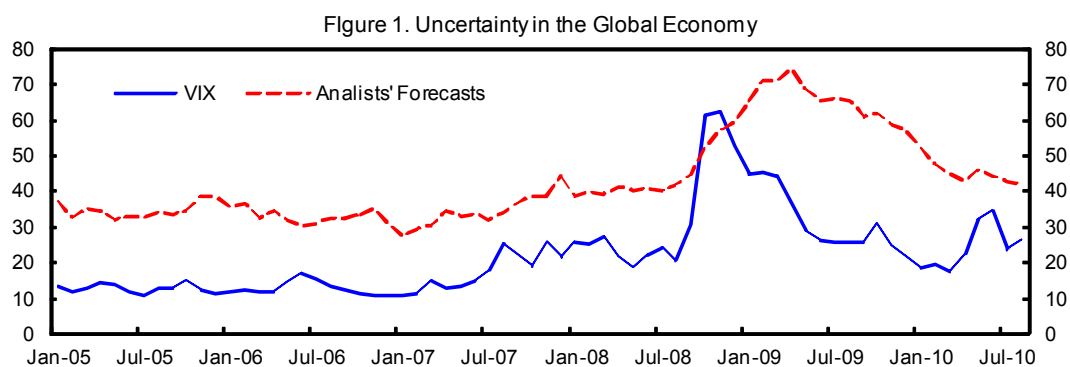
2. The first part of the study outlines the actual risks in the global economy and their effects on Israel. The relationship between risk and Israel's macroeconomic performance is estimated through a regression analysis. The second part of the study focuses on the appropriate macro-financial policies to cope with macro-financial risk, with special emphasis on the appropriate mix of monetary and fiscal intervention.

#### B. The Risks in the Global Economy and their Effect on Israel

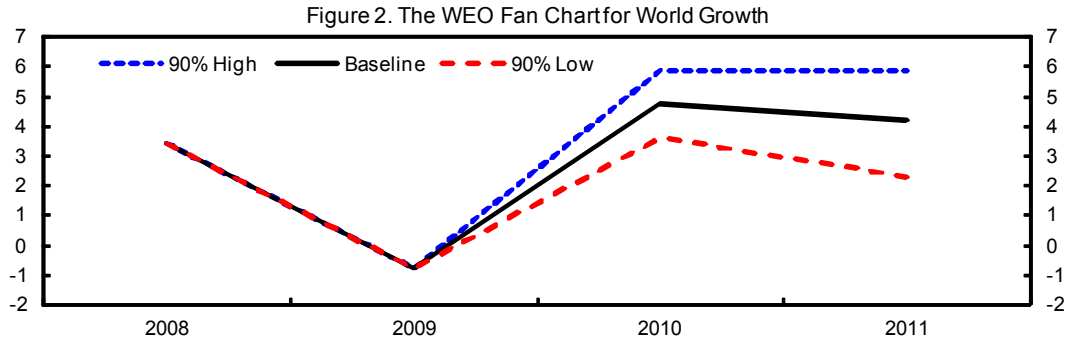
##### Risks are high after the Great Recession...

3. During 2010 the global economy emerged from the brink of a world-wide economic and financial meltdown. Financial markets across the globe have stabilized. Growth has re-started across the globe, briskly in developed countries, at a more subdued pace in advanced economies.

4. Nevertheless, risks to the global outlook remain high, as measured both by price indicators of uncertainty and by the dispersion of growth forecasts across the world. Both measures are above their pre-crisis averages (See Figure 1). This degree of uncertainty is reflected in the WEO projections, which show a central growth scenario of 4.2 percent in 2010, with a 90 percent confidence intervals ranging between 2.3 and 5.9 percent (See Figure 1).



<sup>1</sup> Prepared by Marco Cipriani (INS; mcipriani@imf.org).



5. Both the WEO and the VEA identify several key factors contributing to global uncertainty, both on the upside and the downside. In their analyses, the macroeconomic performance of advanced economies and their financial markets are the driving force that will determine the realized path of world growth in 2011. The main risk factors to the global macroeconomic outlook are the strength or weakness of the corporate and household sector balance sheets in the US; the degree of resilience of the US housing market; and the extent by which the European sovereign market will weather the current bout of turmoil, especially regarding its effects on the European banking sector.

#### **...And Israel is Sensitive to Shocks Coming from Abroad**

6. As a small open economy, with a degree of openness approaching 80 percent and highly integrated with world financial markets, the growth path of Israel's output is heavily affected by the performance of the global economy. In particular, given the elasticity of world trade to world growth, Israeli exports are highly sensitive to the macroeconomic performance of its trading partners. Moreover, disruption in financial markets affects Israel both through its banking sector, and its impact on the shekel. Finally, as a highly export-oriented economy, Israel is significantly affected by changes in its terms of trade.

7. In order to gauge the sensitivity of Israeli output to the global macroeconomic environment, we estimated an AR(1) model of Israel GDP growth, conditional to the behavior of three *exogenous* macro-financial factors:<sup>2</sup>

- i. US growth, as a proxy of the behavior of world trade<sup>3</sup>
- ii. the VIX, as a proxy of the degree of uncertainty in financial markets
- iii. Israel's terms of trade.<sup>4</sup>

<sup>2</sup> There are other risk factors (in particular, security risk) that may affect Israel's macroeconomic outlook. Since these non-economic risks, however, are uncorrelated with macrofinancial risk, they increase the uncertainty faced by Israel's policy makers, thus strengthening our policy conclusions.

<sup>3</sup> Similar results are obtained if we use data on world trade instead of US output. We preferred the current specification, because in order to produce high and low scenarios for world trade, we would have had to rely on assumptions on the elasticity of world trade to world growth.

<sup>4</sup> Strictly speaking, terms of trade are not exogenous, since even a small open economy can re-orient its exports as terms of trade move against it. Nevertheless, over the horizon under consideration, we believe that the bias to the estimates and especially to the forecasts would be negligible.

The regression is estimated on quarterly data from 2000Q1 until 2010Q3. The parameters are reported on Table 1. They are all significant and of the expected sign. The portmanteau statistics for autocorrelation in the residuals is non-significant at all lags

**Table 1. Forecasting Israel's GDP**

Dependent Variable: Israel's GDP, 2000Q1–10Q3

Coefficient	Estimate	Stan. Dev.	P-value
Constant	0.02	0.00	0.00
Dlog (US GDP)	0.38	0.18	0.05
VIX	-0.04	0.02	0.02
Dlog (Terms of trade)	0.06	0.03	0.02
AR(1)	0.56	0.13	0.00
$R^2=0.59$ ; F-stat=13.40; Q(lag 2)=0.42			

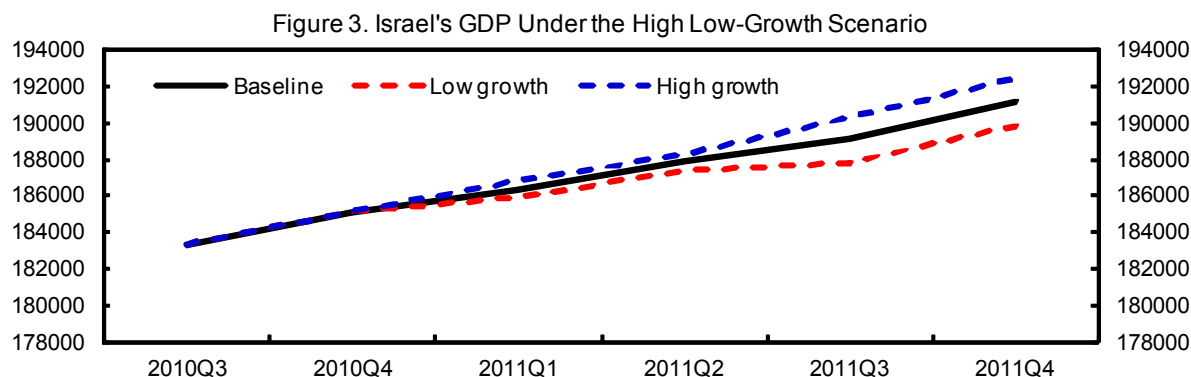
8. To estimate the risk to Israeli growth stemming from global uncertainty, we forecast the path of Israeli growth in Q4-2010 and in 2011 under 3 different scenarios:

- i. A baseline scenario in which US growth in 2011 is 2.2 percent, as projected by the WEO, terms of trade move back to their long-term average<sup>5</sup> and the VIX stays at its 2010 average.
- ii. A high-growth scenario, in which US growth in 2011 is 3.8 percent, consistent with the WEO high-growth scenario. Terms of trade and the VIX are projected as in the baseline case.
- iii. A low-growth scenario, in which US growth in 2011 is 0.25 percent, consistent with the WEO low-growth scenario. Terms of trade and the VIX are projected as in the baseline case.<sup>6</sup>

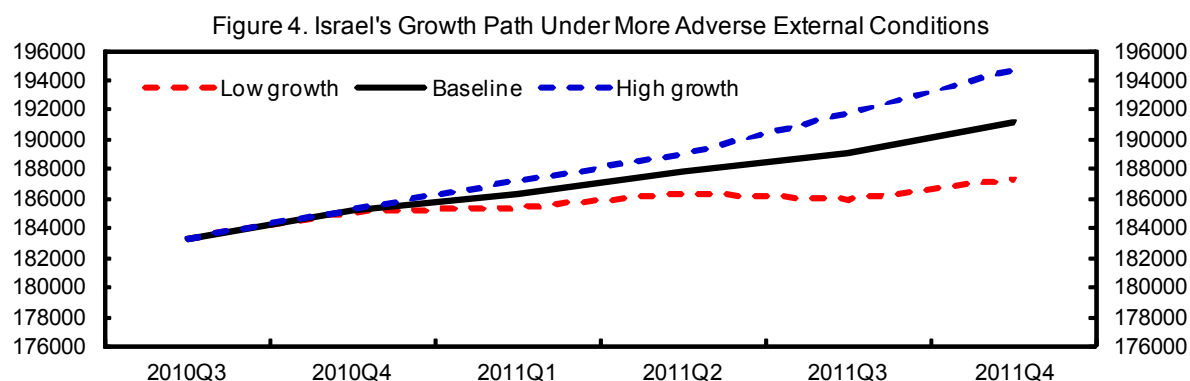
Figure 3 shows the forecast path of Israeli GDP given the different scenarios for the behavior of US growth. The difference between the high-growth and the low-growth scenarios amounts to more than 1 percent of 2011 GDP, a relatively high figure.

<sup>5</sup> In particular, to their 2000–10 average.

<sup>6</sup> These scenarios do not represent 90% confidence intervals, since the exogenous variables are correlated. Nevertheless, these correlations are quite low in our sample. For instance, the correlation between Israel's terms of trade and US growth is only -0.11, and as a result, the stabilizing effect of a change of terms of trade in the face of a US recession would be quite small. The correlation between VIX and US growth is higher, but negative, thus biasing our estimates of sensitivity of shocks coming from abroad downward, not upward.



9. The risks facing the Israeli economy increase substantially if we forecast the path of GDP growth under scenarios in which not only US growth deviates from its baseline projection, but so do terms of trade and the VIX. If we project 2011 GDP under these assumptions<sup>7</sup> the difference between the high-growth and the low-growth scenarios is more than 2% of 2011 GDP, that is, of a very high magnitude.



10. The results of the regression exercise show that the Israeli economy is very sensitive to external conditions. The difference between the high-growth and the low-growth scenarios are somewhere in between 1 and 2 percent of GDP, a relatively high degree of uncertainty with respect to growth prospects.

### C. The Policy Response to Macrofinancial Risk

11. Given the sensitivity of the Israeli economy to global risks, how should risk itself inform policy makers' decisions? This section organizes the discussion along three lines:

- policies designed to increase the resilience of the economy to adverse shocks;
- how uncertainty should affect the timing of fiscal and monetary policy;

<sup>7</sup> In particular we assume that, in the high (low) growth scenario terms of trade are two standard deviations above (below) their baseline projections; whereas the VIX moves from today's level towards the maximum and the minimum level reached during 2006–10.

- the effect of global uncertainty on the appropriate fiscal and monetary policy mix.

## **Resilience**

12. The increase in global macrofinancial risk calls for policy measures aimed at making the economy more resilient to global shocks. Keeping a high level of reserves is the traditional instruments used by small economies as a form of country insurance.<sup>8</sup> Over the past two years, Israel has moved in this direction, and reserves now cover 11 months of imports, a high number by international standards. Moreover, given the relatively high level of the debt to GDP ratio in Israel, and the recent turmoil in the European sovereign markets, efforts to reduce its level of debt are necessary. Israel's projected path of fiscal policy does imply a gradual reduction of the debt to GDP ratio towards 60%. Nevertheless, efforts to speed up the pace of fiscal consolidation would be appropriate. Finally, although the Israeli banking and financial system is tightly and conservatively supervised in comparison to many advanced economies, further strengthening of the supervisory framework of the financial sector would be desirable.

## **Timing**

13. In addition to increased resilience, uncertainty on the global outlook may have implications on the timing of monetary and fiscal policies. In particular, an argument could be made that policies should be more expansionary as a form of insurance against the possibility that a low-growth scenario materializes, i.e., a negative shock from the rest of the world buffets the economy. This is true under two conditions, neither of which applies to Israel: 1) unemployment (and output growth) has relatively more weight than inflation in the policy makers' objective function; 2) the central-case scenario projects a macroeconomic outcome that is highly unsatisfactory in terms of prospective growth and unemployment rate.

14. However, given Israel's history of financial instability, inflation should probably be as important as unemployment in the loss function of policy makers. Moreover, the central case scenario for Israel is benign, with the output gap closed or about to be closed, unemployment almost at all-time lows and output growth close or even above potential. In this circumstance, the risk of inflation overshooting its target, should policies be relaxed in the face of benign external conditions, carries more weight than opposite one. As a result, the insurance argument calls for more, not less, restrictive policies in the face of high uncertainty. As an illustrative example, one can make the case that, because of insurance considerations, uncertainty in the face of high unemployment calls for more expansionary policies in the US; by the same argument uncertainty in the face of unemployment close to its full-employment level calls for policies to be more restrictive in Israel.

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<sup>8</sup> For a detailed discussion on country insurance and uncertainty, see OP254, IMF, 2007.

## Policy Mix

15. The final point regards the effect of uncertainty on the appropriate monetary and fiscal policy mix. Given current competitiveness concerns facing Israel, fiscal policy should shoulder the bulk of the policy adjustment toward a more restrictive stance. Fiscal restraint would allow monetary policy to respond to external shocks, without being restrained by concerns about the appreciation of the shekel.

16. Under this analysis, should a low-growth scenario materialize the current relatively high level of interest rates would leave room for the Bank of Israel to relax its policy stance, even while fiscal consolidation is in place. Should a high-growth scenario materialize, fiscal consolidation would help allay the competitiveness problem, while monetary policy would be free to raise interest rates without fear of squeezing the external sector of the economy.

17. The likelihood of a sudden reversal in capital flows does not invalidate the analysis, since interest rate increases and intervention policy would be in this case the natural mechanism to offset the pressure on the exchange rate. On the contrary, should the outflow stem from a drop in confidence in government securities (e.g., contagion from the European crisis) a stricter fiscal stance and a lower debt to GDP ratio would likely decrease Israel's perceived country risk.

18. When would a pre-emptive fiscal tightening be counterproductive? Under two scenarios. The first is a domestic shock to the economy (e.g., a collapse of the housing sector or a "security shock," generating a sharp drop in consumer confidence and, as a result, in private consumption). In this circumstance, policy makers would need the full power of both monetary and fiscal policies to sustain aggregate demand. Since the lags in the implementation of discretionary fiscal policy changes are long, the fiscal tightening would limit the scope for the authorities to support domestic demand.

19. Pre-emptive fiscal tightening would also be counterproductive should low growth and high inflation come from the rest of the world, e.g., because of a supply shock generating stagflation. Under this scenario, monetary policy could not react without creating further inflation, and the support to domestic demand would have to come from fiscal policy. Given the current high level of unemployment and low level of resource utilization in the US and in most advanced economies, the likelihood of such scenario is extremely low.

20. To conclude, this background study argues that, in the face of high global risks, an insurance argument coupled with Israel's current macroeconomic outlook calls for more restrictive, not less restrictive, policies. Fiscal policy, moreover, should take the brunt of the adjustment, both to increase the economy's resilience, and to allay competitiveness concerns.

## **IV. MEDIUM-TERM EXPENDITURE PLANNING IN ISRAEL<sup>1</sup>**

### **A. Introduction**

1. Fiscal institutions in Israel—such as the fiscal rules, which limit deficit and real primary spending growth—have helped to reduce public debt and public expenditure from high levels. However, given the reductions already made, risks that medium-term potential growth has declined, and the aim to reduce taxation further, additional expenditure compression may pose greater technical and logistical challenges than were faced in the past. This raises the premium on the strength of the administrative and policymaking mechanisms in place to deliver these outcomes.
2. This note considers the adequacy of the medium-term expenditure planning mechanisms currently in place in Israel to implement these tasks well—i.e., mechanisms capable of delivering key infrastructural, safety net, and equity objectives while: (i) rendering planned medium-term expenditure reduction credible now (including that detailed commitments conform to the aggregate ceilings); (b) clarifying for policymakers *ex ante* the key medium-term strategic expenditure trade-offs—e.g., the case for reducing across the board versus cancelling whole programs; and (c) avoiding shocks to tax policy if debt and expenditure do not decline as planned.
3. The note is organized as follows. The next section provides an overview of Israel’s current medium-term expenditure planning mechanisms. Section 2 highlights key issues with these mechanisms. Section 3 puts Israel in international context, comparing current expenditure planning mechanisms in Israel with those in other advanced countries, highlighting key areas of achievements and weaknesses in Israel. The last section summarizes key priorities for institutional improvements to strengthen medium term expenditure planning mechanisms.

### **B. Current Medium Term Expenditure Planning Mechanisms**

4. This section summarizes procedures used to project the aggregate spending ceilings over the medium-term—what macro scenarios are considered, to what level of detail, agencies involved and what sort of technical modeling equipment is used to derive the macro-fiscal framework and the corresponding aggregate expenditure ceiling. Furthermore, the section also highlights medium-term expenditure planning mechanisms for individual line ministries and operations in place, for example in defense, infrastructure, and education budgets.

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## Macro-Fiscal Framework

5. The macroeconomic framework is prepared by the economic and the research department of the Ministry of Finance, taking into account consensus forecasts. Other institutions involved in the formulation of the macroeconomic framework are the Bank of Israel and the National Economic Council. The macroeconomic framework typically produces forecasts for real GDP growth, private consumption, exports, and imports for two and a half years ahead, effectively covering the budget years. Growth projections for the budget years are based on econometric models, while long-run simulations are based on various, generally cautious assumptions of potential output growth. Forecasts are typically prepared in March–April of each year, before the start of the budget preparations.

6. The medium term fiscal framework is underpinned by the macroeconomic framework and the new fiscal rules. These rules, embedded in the Deficit Reduction and Budgetary Expenditure Limitation Law, set limits on the path for the central government deficit (falling from 6 percent in 2009 to 1 percent from 2014 onwards), and on the annual growth of real central government spending. The latter sets spending growth as a function of public debt—rising, as the gap falls between debt and its 60 percent of GDP target; and rising with trend GDP—measured as a 10 year moving average—and with projected inflation. This formula caps real spending growth in 2011–12 budget at 2.66 percent. The more restrictive of the two rules takes precedence; for example, spending will be held below the formula level if necessary to secure the deficit path and vice versa, the deficit will be held below the deficit ceiling if necessary to adhere to expenditure ceiling rule. In addition, the aggregate fiscal revenue projections also account for the impact of medium term tax policy reforms, which envisage that individual and corporate income tax rates would decline annually to 2016. While the Ministry produces internal medium-term fiscal revenue projections, the official revenue projections are only presented for the budget years.

7. The aggregate expenditure envelope for the budget years is determined by tax, deficit, and spending rules. Reconciliation between top-down expenditure ceilings and bottom-up expenditure commitments under current policies—“automatic pilot”—is then carried out. Inconsistencies between the automatic pilot and top-down expenditure ceilings are reconciled only for the budget years. The new expenditure ceiling rules, together with the two-year budget have helped reducing the size of this inconsistency by forcing reconciliation over a longer horizon. The new expenditure rule increased fiscal space for new programs by allowing for higher real spending growth rate, as compared to the previous expenditure ceiling rule.<sup>2</sup> Further efforts to resolve these inconsistencies also included revenue-increasing measures—e.g. deferring the planned 0.5 percent VAT rate cut to 2013, base—broadening measures and higher energy taxes. While medium-term internal expenditure estimates of the automatic pilot are being produced, the reconciliation between top-down expenditure ceilings and bottom up spending commitments is carried out only for the budget years.

## From Aggregate Savings to Sectoral Allocations

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<sup>2</sup> See the 2011–12 budget assessment of the Bank of Israel.



8. This section summarizes medium term expenditure planning mechanisms for individual line ministries and operations now in place, focusing on existing sectoral medium – term expenditure strategies, current process, and mechanisms of establishing priorities and different institutions involved in the process.

*Top-down definition of the expenditure envelope*

9. Typically, the process of translating the aggregate expenditure envelope into ministerial spending allocations covers only the budget years and is performed mainly using a top-down expenditure allocation approach for the individual line ministries. The Ministry of Finance maintains control over the budget preparation and execution process, to enforce fiscal discipline and to ensure adherence to expenditure ceilings.

10. The budget department distributes budget ceilings to line ministries, based on existing legislation (State Budget Law and the Economic Arrangements law) as well as key macroeconomic assumptions. With the introduction of the two-year budget, this process did not change. In the context of the two-year budget the MoF distributes two separate tables for years 2011 and 2012 to line ministries. Each table contains total expenditure ceiling, revenue dependent spending, spending authorization, and finally maximum personnel for each line ministry, broken down by recurrent and capital spending.

*Bottom-up medium-term expenditure plans and commitments*

11. Key expenditure items have medium term orientation—plans and strategies are available, well beyond the two-year budget. For example, public sector wage forecast for next three years is based on the three year public sector wage agreements with trade unions. The most recent agreement granted 6.5 percent nominal increase over the next 3 years. There are also medium term strategies for health, education (e.g. a new budget model for higher education), social spending (e.g. pensions), five-year plans for transport infrastructure, and a five-year rolling expenditure planning framework for the defense sector.

12. The 5-year rolling MTEF framework of the Ministry of Defense (MoD), which has been implemented in response to Brodet’s committee recommendations, is a good example of medium-term expenditure planning program (See Box 1). This framework enhanced predictability of finance available to the sector and allowed for a tighter link between policy goals, strategy and budget resource allocation. Furthermore, institutional reforms, which increased the power and the size of the MoDs budget department, enhanced the quality of the medium-term expenditure planning, accountability, and resulted in more efficient use of human resources. Finally, the relatively greater budget autonomy of the MoD as compared to other line ministries is also reflected in enhanced budget management flexibility, which has

### Box 1. Medium-term Expenditure Planning in the Ministry of Defense (MoD)

Following the 2007 recommendations of the Brodet committee, the MOD was charged with the preparation of strategic plan and five year defense budget framework for all defense outlays, backed with an indicative planning horizon for additional five years. The committee also recommended well-defined and transparent budgetary preparation process, including a definition of minimum levels of allocations to key activities (e.g. acquisitions, R&D, training, and preparedness), including explicit budgeting of reserve funds for unexpected developments, and setting up an intergovernmental forum to advise IDF chief of staff and the defense minister on budgetary and economic issues and on monitoring and implementation of the government budget decisions.

For the first time, a formal five-year rolling plan for 2008–12, based on macro-assumptions used by the MoF, has been approved by the Government. This plan separates baseline scenario and the impact of new policy initiatives. Once approved by the Government, the MoF cannot alter the budget. However, during the budget preparation process, there are some discussions with the MoF on the budget estimates and on some statistical data discrepancies. The ministry also has contingency plan – or rather contingent programs, ranked by priority, which can be executed if the budget execution is sluggish, to avoid under execution of spending.

Budget management and preparation process is centralized in the financial advisor's department, which is adequately staffed (the department is larger than the MoF's budget department). This centralization —a result of the 2007 institutional reforms in the budget department of the MoD— is viewed critical to strengthening expenditure planning capacity, contributing to better budget formulation and management.

Increased budget flexibility was viewed essential by the MoD to encourage efficiency and to ensure timely budget execution and meeting the program targets. There are special arrangements for the MoD's budget execution, allowing for much more budget flexibility of the MOD's budget in comparison with other line ministries. For example, there is no requirement of advanced approval for reallocation of budget across various expenditure allocations by the Finance Committee of Knesset. The only requirement is to send an execution report every quarter to the Finance Committee.

Perhaps the stronger bargaining power of the MoD reflects the much greater independence and flexibility in expenditure planning, budget formulation and budget execution.

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#### MoD Budget Calendar

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**February:** Beginning of budget implementation.

**April–May:** Assessment previous year's budget implementation.

**May–June:** Strategic assessment, in parallel with budget preparation (operational assessment, policy, focus areas in coming year).

**August–September:** The MoD's budget presented to the government (PM and the Minister of Finance).

**October:** The MoD budget submitted to the Finance Committee of Knesset.

**November–December:** Approved units' detailed work program, so that by the end of the year the MoD has an approved centralized work plan and budget for next year.

created incentives for fiscal savings that could then be used for relatively small new initiatives. However, this greater budget autonomy also reflected stronger bargaining power of the MoD vis-à-vis other line ministries.

13. Another good example of medium-term expenditure planning is the newly developed six-year program for higher education, HE, which will start its implementation in 2011. Key program objectives are to encourage excellence in research, improve quality of teaching, and expand enrolment in HE within the ultra-orthodox, the Arab sector and youths from the periphery. To achieve these objectives, the program utilizes an outcome-based, transparent budget planning process, which encourages competition between institutions and creates incentives for excellence in research, with special budget allocation for higher education of the disadvantaged groups.

14. There are also some examples of medium-term planning in the education sector. These include, the “New Horizon” reform program, the Integration Law (special education), the program to reduce classroom size to 32 students, the program to split classes in Grades 1 and 2, programs for sick children and a five year program for classroom construction.

15. The Ministry of Transport also prepares multi-year spending plans. Examples of multi-year planning include the railway program (2003–14), programs for construction of roads between cities (2005–10), public transport in the cities, and roads in the cities. These programs consist of large infrastructure projects, which already imply a significant increase in planned expenditure commitments in the medium term. Furthermore, there is also a risk that actual outlays maybe even larger, given that large public investment projects have been implemented with significant cost overruns and with very long delays.<sup>3</sup>

### ***The role of the two-year budget and the new fiscal rules for establishing priorities***

16. Currently, there is no formal process of medium term expenditure prioritization. This is because while medium-term plans exist in a number of areas, as described above, these are independent of each other and thus are not subject to a formal adding-up constraint. Instead, expenditure prioritization is taking place in the context of the two-year budget preparation. The new expenditure ceiling rule, therefore, is a valuable tool for the Ministry of Finance in the bargaining process, as it helps maintain control over the budget. Based on the expenditure ceilings and the policy framework, line ministries budgets are determined by the ministry of finance with inputs from the line ministries. There are no formal spending reviews and procedures. The current process does not allow for reexamining existing spending commitments, resulting in high spending rigidity.

17. The Finance committee and the budget department of the Ministry of Finance exercise strong oversight and control over the line ministries budgets, through maintaining a

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<sup>3</sup> See The Bank of Israel Annual Report 2009, Chapter 6, Box 6.3, pp.280.

large number of budget lines (see OECD report, which recommended a reduction in the number of budget lines) and limited budget flexibility across these budget lines. Possible capacity issues, but also inadequate incentives may prevent line ministries from having more control over the budget process.

18. The Ministry of Finance and the Finance committee can grant more budget flexibility if necessary, but only with their permission. Formally, carry over is only allowed for commitments already made, reallocation between line items is only possible with MOF permission and with the agreement of the Finance committee.

### **C. Issues with the Fiscal and Expenditure Planning Framework**

19. This section highlights key issues with the new fiscal framework and with the expenditure planning framework, focusing on: (i) consistency between aggregate expenditure constraints and the automatic pilot in the medium term, (ii) quality, composition and efficiency of public spending, (iii) managing risks and vulnerability to shocks, and (iv) managing macro-fiscal consequences of natural gas wealth.

#### **Consistency between aggregate constraints and automatic pilot**

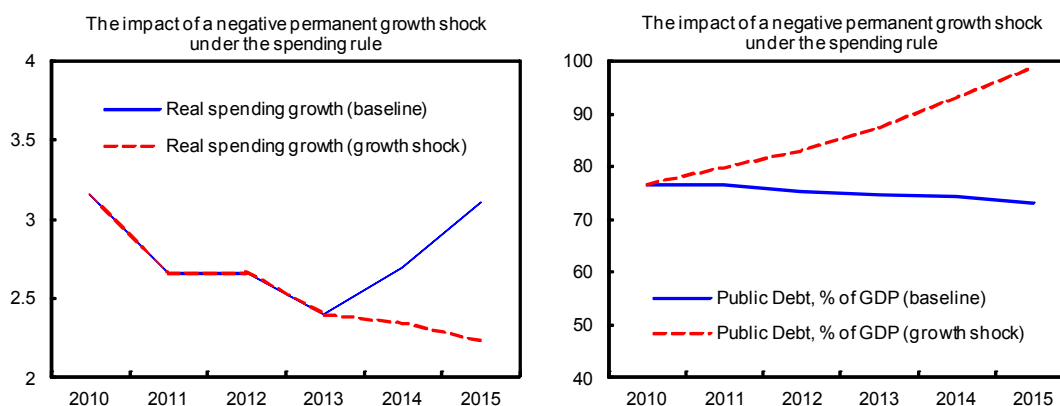
20. At present, Israel does not develop and publish multi-annual expenditure estimates based on current policies or current law. At the same time, most of the individual line ministries produce medium term strategy documents. Some sectors (e.g. the Ministry of Defense) also produce multi-year rolling medium-term expenditure planning frameworks. However, most of these multi-annual spending documents are developed independently of each-other and often cover different time periods. Importantly, there are no expenditure prioritizing mechanisms to ensure that the sum total of expenditure commitments of these programs do not exceed the aggregate expenditure ceilings.

21. As a result, the sum total of these bottom-up expenditure commitments typically exceed medium-term expenditure ceilings, as implied by the fiscal rules and planned tax policy reforms. But the rules imply reductions in expenditure to GDP of some 2 percentage points by 2015, on top of reductions of 5 percentage points in recent years. This contrasts with bottom-up commitments already made. Reconciling these—and thereby securing the credibility of the fiscal rules—will require a thorough review of medium-term expenditure priorities, and a strengthening of planning mechanisms to complete and implement that review.

22. Expenditure compression could be even larger in the event of an adverse growth scenario under the expenditure ceiling rule (Figure 1a). For example, under the expenditure ceiling rule, a negative permanent shock to real GDP growth (real GDP growth rate assumed to be one standard deviation below the baseline forecast) would lead to lower real expenditure growth than in the baseline scenario, implying an even larger expenditure

compression. At the same time, given the built in lagged effects in the new expenditure ceiling rule, the share of expenditure in GDP will be growing, as the real spending growth is still larger than the real growth of GDP. At the same time, tax receipts would be much lower, given the lower GDP growth, therefore resulting in large deficits and rapid accumulation of public debt (Figure 1b). Expenditure compression would be even larger (increasing by 5–6 percentage points of GDP by 2015) with the enforcement of the deficit ceiling rule. Without medium-term orientation, there is therefore a risk of low quality of fiscal adjustment.

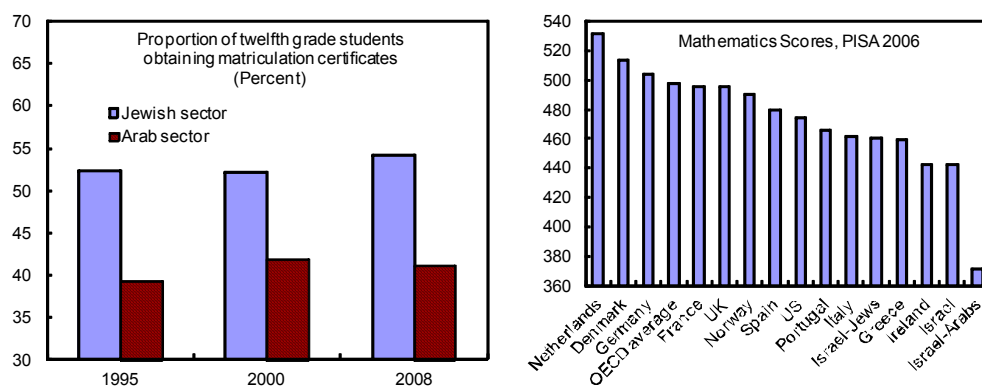
Figure 1. Aggregate Constraints, Expenditure and Revenue Policies: Consistency Check



### Quality, composition, and efficiency of public spending

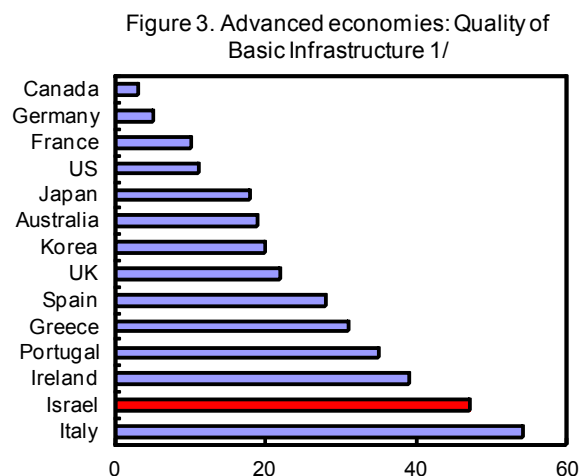
23. There is also an issue with quality, composition, and efficiency of public spending. The lack of formal arbitration mechanisms for strategic prioritization across and within sectors also affects negatively the quality, efficiency, and composition of public spending. Outcome-based indicators for the quality of education, for examples, show that Israel is lagging behind significantly as compared to other advanced economies (See Figure 2).

Figure 2. Education Outcomes in Israel: A Comparative Perspective



Source: Bank of Israel.

24. Outcome-based indicators for the quality of basic infrastructure also show a similar picture. Acute gaps in the quality of basic infrastructure are perceived in all key basic infrastructure sectors, such as energy, transport and water sectors (Figure 3). The lack of medium term expenditure prioritization has likely affected the quality and quantity of infrastructure service provision. Despite the existence of medium term programs for developing the transport infrastructure, most of these programs only consist of soft commitments and priorities get sorted out only for budget years. Lack of prioritization, especially during expenditure compression periods may lead to excessive cuts in public investment; therefore lower the quantity and quality of infrastructure services. Such an anti-investment bias can create infrastructure gaps, hampering medium term growth potential.<sup>4</sup>



Source: IMD, World Competitiveness Online, 1995–2010.  
1/ Countries ranked by the quality of basic infrastructure, where 1 is the best and 54 the worst.

25. Furthermore, there is also concern with the quality of public investment planning process. There is a well-documented evidence of inadequate public investment planning, manifesting in long delays (in some cases a decade or more) of public investment projects and excessive overruns of investment costs over and above the panned costs.<sup>5</sup>

### Managing risks and vulnerability to shocks

26. Medium-term orientation is also needed for assessing vulnerability to shocks and for designing an adequate risk management strategy. It is difficult to assess the impact of fiscal risks, to incorporate them in fiscal policy analysis and to design adequate risk management strategy given the focus on the budget years. The adoption of a medium-term planning framework would allow for assessing risks from macroeconomic shocks (e.g. adverse growth shock and its implication for the medium term framework) by means of sensitivity analysis, stress-testing of the macro-framework and possibly stochastic analysis. Similarly, such a framework can also incorporate and plan for risks from contingent liabilities (e.g., likely expected costs of guarantees), the implications of changes in demographic trends, and prepare to deal with natural disasters risk.

<sup>4</sup> There is well documented evidence that large fiscal adjustments since early 1990s in Latin America may have come with an excessive fall in public investment. See Easterly, Irwin and Serven (2007).

<sup>5</sup> See Chapter 6 of the 2009 Annual report, Bank of Israel.

27. Ensuring adequate macro-fiscal management of the natural gas wealth, requires designing a fair and stable taxation of non-renewable resources—in particular natural gas—and a strategy for intergenerational allocation of the natural gas wealth. Assessing fiscal implications of these activities, designing strategies for the use of the natural gas wealth and ensuring consistency with current fiscal rules would require longer-term planning horizon.

### **Lack of mechanisms for medium-term prioritization**

28. Finally, going forward, there is an issue of a mismatch between the current short-term perspective of the expenditure allocation and the medium term orientation of key fiscal policy priorities (e.g. achieving better education outcomes, improving quality and quantity of infrastructure services, and reducing poverty and inequality through labor market reforms). At present, the expenditure envelope allocation covers only the budget years, while these goals require re-balancing fiscal policy priorities and careful planning, linking goals, policies and budgets.

29. Rebalancing fiscal priorities also calls for the need to secure fiscal space for increasing public spending in these areas. Fiscal space for these priorities is already limited by the medium-term fiscal consolidation plan, implied by the new fiscal rules and by the planned medium-term tax reforms, aiming at further reductions of the direct tax burden in the medium term. Therefore, additional fiscal space to accommodate these priorities can only be created by improved composition and efficiency of public spending. However, lack of reexamination of existing policies and spending commitments leads to relatively high expenditure rigidity, possibly lower spending efficiency, therefore limiting fiscal space for new policy priorities.

### **D. Medium-Term Expenditure Frameworks in Advanced Economies: A Comparative Perspective**

30. This section presents a brief overview of the existing medium-term expenditure framework, MTEF, models in advanced economies and puts Israel's current medium-term expenditure planning mechanisms in international context.

#### **MTEF models in advanced economies**

31. Fiscal frameworks or rules are most effective in sustaining fiscal effort when they are combined with a credible MTEF. Well-designed MTEFs provide a mechanism for operationalizing the government's fiscal objectives by facilitating more strategic policy prioritization, encouraging longer-term ministerial budget planning, and enforcing multi-year expenditure discipline. There is, however, a fundamental tension in MTEF design between these objectives, which is reflected in the range of advanced country models which vary in terms of

- Coverage of the medium-term expenditure ceilings—categories and proportion of spending subject to ceilings;
- Level of detail – the number of ceilings they impose on the budget process; and
- Discipline – whether the frameworks are rolling or fixed and the frequency with which those ceilings are updated.

Table.1 Key features of MTEF models: an international perspective

	COVERAGE				LEVEL OF DETAIL *	TIME HORIZON	DISCIPLINE	
	Soc Sec	Debt Interest	Local Govt	% of public spending			Rolling or Fixed	Frequency of Revision
<b>Finland</b>	Some	No	No	<b>36%</b>	<i>Total Spending 13 Ministries</i>	<b>4</b>	4 fixed	Every 4 years
<b>Netherlands</b>	Yes	No	Some	<b>80%</b>	<i>4 Sectors 31 Subsectors</i>	<b>4</b>	4 fixed	Every 4 years
<b>United Kingdom</b>	No	No	Some	<b>59%</b>	<b>25 Depts</b>	<b>3</b>	2 fixed + 1 rolling	Every 2 years
<b>France</b>	No	Yes	No	<b>31%</b>	<b>35 Missions</b>	<b>3</b>	2 fixed + 1 rolling	Every 2 years
<b>Sweden</b>	Yes	No	Some	<b>64%</b>	<i>Total Spending 27 Areas</i>	<b>3</b>	2 fixed + 1 rolling	Every year
<b>Australia</b>	Yes	Yes	Yes 1/	<b>100%</b>	<i>20 Depts 267 Progs</i>	<b>4</b>	Rolling	Twice a year
<b>Uganda</b>	Yes	Yes	Yes	<b>100%</b>	<i>16 Sectors 162 Progs</i>	<b>3 to 5</b>	Rolling	Every year
<b>Israel</b>	Some	Yes	Some	<b>100%</b>	<i>By LMs</i>	<b>2</b>	2 fixed	...

1/ In Australia, the MTEF includes local government payments the Commonwealth makes to the local governments, not spending by the local governments.

\* **Bold** = Fixed multi-year ceiling; *Italics* = Indicative multi-year projection

32. MTEF models that have proven successful can be divided into three broad categories based on where they strike the balance between these competing objectives:

- The aggregate expenditure ceiling model developed in Finland, the Netherlands, and Sweden. This model fixes a firm ceiling on total expenditure in nominal terms for two to four years which is not revised for that period. In Finland and the Netherlands, these ceilings are codified in a political agreement of the governing coalition and fixed for length of parliament, whereas in Sweden, it is fixed for the first two years with a third year added at each budget. Given the primacy attached to respecting that ceiling, these models do not set binding multi-year limits for each ministry or sector below the ceiling but leave this to the discretion of the annual budgeting process. This is a model which emphasizes the fiscal discipline objective over the prioritization and planning objectives.
- The fixed ministerial planning model is adopted in the U.K. and Canada. These countries, by contrast, do break down the overall expenditure envelope into a set of binding nominal multi-year expenditure ceilings for each ministry, but they also tend to revise these ceilings more frequently (every two to three years) and cover less of



the public sector overall. Thus, by comparison with the aggregate expenditure ceiling model, this model emphasizes the need to provide certainty to line ministries at the expense of coverage and aggregate expenditure discipline.

- The rolling program estimates model, adopted in Australia and New Zealand provides a very detailed breakdown of expenditure and cover nearly all of public expenditure. However, what these approaches gain in terms of detail and coverage, they sacrifice in discipline as these detailed forward estimates are revised at each budget so line ministries have less certainty about their overall future allocations. Discipline is enforced instead at the cabinet level through a transparent, rigorously-enforced set of rules and procedures for presenting and approving new expenditure proposals.

### **Benchmarking Israel's medium-term expenditure planning mechanisms**

33. What can be learned from putting Israel in international context? Given the authorities plans to continue fiscal consolidation in the medium-term, maintaining fiscal discipline and aggregate expenditure control has to be an overarching objective of implementing medium-term expenditure framework in Israel. Furthermore, comparisons with effective fiscal frameworks in other countries suggest that coverage of aggregate expenditure ceiling in the context of Israel is relatively broad, while the level of aggregation is similar to European advanced countries, rather than to Australia and New Zealand, which are based on detailed program estimates over the medium-term.

34. Israel stands out by the short-term focus of its expenditure planning mechanisms. Currently, consistent spending plans are covering only the budget years with the two-year budget being the main vehicle for this process.<sup>6</sup> By contrast, the MTEFs implemented in all other countries have a relatively longer-term focus – typically covering three to four years.

35. There are also issues related to the last dimension of expenditure planning mechanisms in Israel. In particular, while the two-year budget is a major innovation, it is still an experiment so there are still some open question with regard to: (i) mechanisms to deal with larger risks inherent in the second year of the budget; (ii) envisaged frequency of revisions (if any), and (iii) conditions under which the second year estimates would be revised.

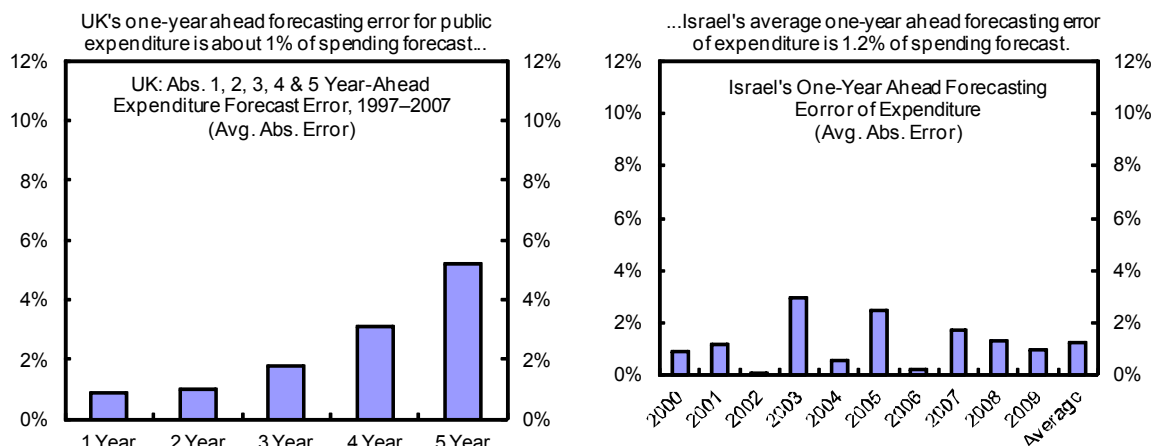
36. On the positive side, Israel squares well in terms of reliability of its one-year ahead expenditure forecasts, which is of critical importance for building a sound MTEF. The one-year ahead average expenditure forecasting error over 2000–09 is relatively small despite a

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<sup>6</sup> Note that while the Budget law contains a provision that requires the MoF to submit a third year rolling estimates, those cannot be formally considered as a third year since no effort is made to eliminate inconsistencies between bottom-up spending commitments and top-down aggregate ceilings for the years not covered by the budget.

number of external shocks that hit the economy during this period and about the same as the average one-year ahead expenditure forecasting error in UK (Figure 4).

Figure 4. Credible Annual Budget and Good Expenditure Forecast Accuracy



37. In addition to good fiscal planning, most MTEFs also incorporate mechanisms to allow for contingencies. Built-in explicit and implicit contingency reserves are especially important for countries that have fixed some or all expenditure for relatively long period of time, as forecasting errors are likely to be higher in these cases. These contingency margins could be implicit – like using more conservative assumptions for GDP or other economic assumptions – or explicit – either allowing for a contingency reserve in spending forecasts or targeting a more prudent fiscal balance than implied by the fiscal rules/objectives. Different countries use different combinations of these margins (see Table 2). However, countries with strong prioritization mechanisms, which find it easier to adjust line ministries allocations downward (as with rolling frameworks in Australia and New Zealand), tend to build in lower contingency reserve and rely more on explicit margins, rather than on implicit ones.

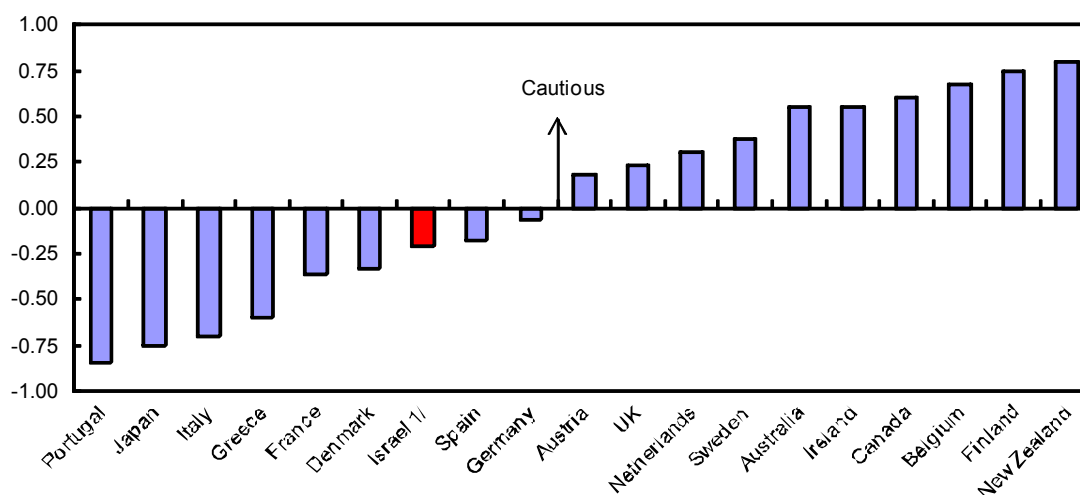
Table 2. Fiscal forecasting and built-in contingency reserves.

	Implicit Margins		Explicit Margins		Total Contingency
	GDP forecast	other economic assumptions	within expenditure estimate	within budget balance	% of total spending
<b>Canada</b>	MoF uses ave of ind. forecast	MoF adds 0.5 to 1% to interest rates and runs through model	Contingency reserve of 1.5 to 2% of total spending	MoF targets a surplus of 0.1% of GDP despite balance rule	<b>3.5 to 4%</b>
<b>United Kingdom</b>	MoF uses GDP forecast 0.25% below trend	7 other economic assumptions explicitly 'cautious'	Reserves and margins equal to 0.75 to 1% of total spending	MoF targets ave. surplus of 0.2% of GDP despite Golden Rule	<b>2.5 to 3%</b>
<b>Sweden</b>	MoF claims to use central assumptions for GDP and its determinants but recent forecasts have proven cautious		Budget margin within expenditure ceiling rising from 1.5 to 2.5% of total spending	MoF's MT objective was ave. surplus of 2% of GDP over cycle (1% post 2007)	<b>1.5 to 2.4%</b>
<b>Netherlands</b>	Deficit target & expenditure ceiling in CA & Budget based on cautious economic scenario in which GDP 0.5 to 1% below outturn		Central contingency reserve of 0.1% of total spending	Most recent CA targets structural surplus of 1% of GDP	<b>1 to 2%</b>
<b>Australia</b>	Budget is based on central economic assumptions		A CBA allowance increasing from 0.25 to 1.5% of total spending by the end of the MTEF period. 1/	MoF targets a surplus of 1% of GDP on average over the medium term.	<b>0.25 to 1.5%</b>
<b>New Zealand</b>	Budget is based on central economic assumptions		Central contingency reserve of 0.25% of expenditure	No stable fiscal objective but targeted surplus since mid 90s	<b>0.25%</b>

1/ In Australia, the conservative bias allowance (CBA) is expressed as a percent of total spending, excluding the GST payments to states.

38. Prudence built into their fiscal projections reveals itself in outturn in the form of positive forecasting errors for budget balance (Figure 5). Out of ten countries with prudent forecasting records for the budget balance, seven operate some form of medium-term expenditure framework. Israel's track record in this respect have also been relatively good—the average annual forecasting error for the budget balance is close to zero, despite several economic crises and external shocks over 2000–07.

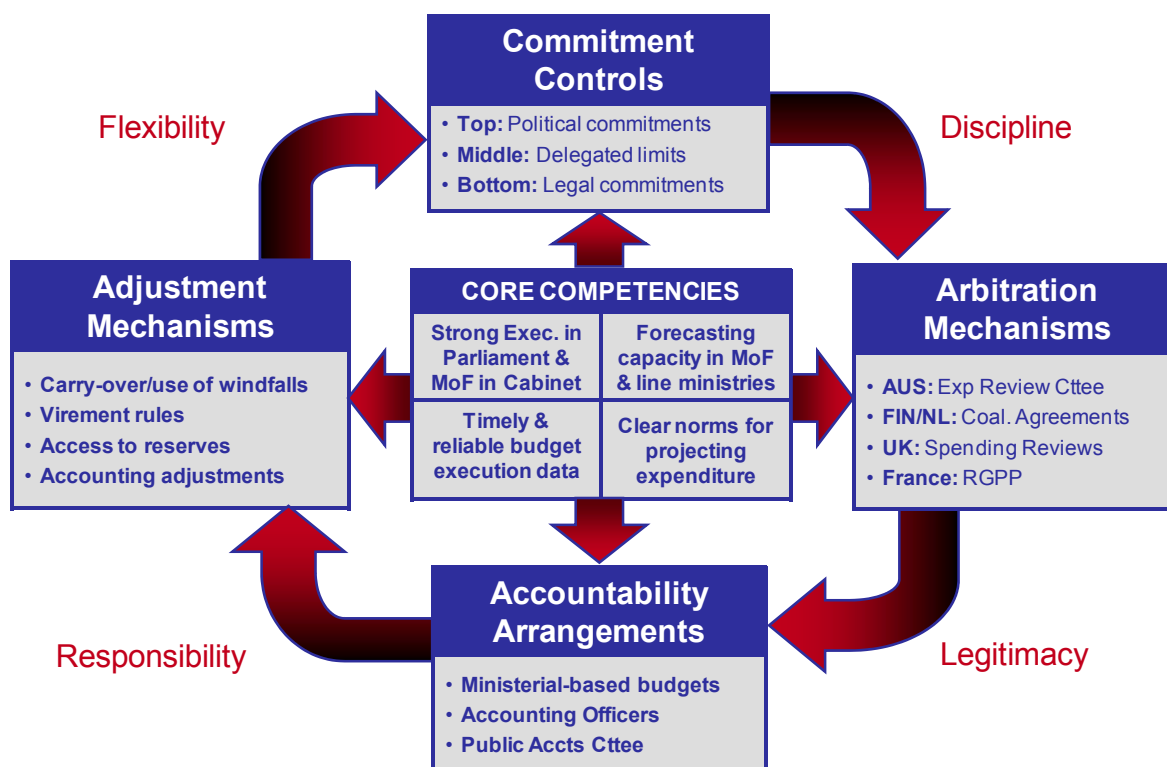
Figure 5. Avg. Annual Forecasting Error for the Budget Balance, 1997–2004 (Percent of GDP)



1/ Israel data covers 2000–07.

39. Successful MTEFs go well beyond a run of numbers in a document. They are supported by a set of core competencies at the center of the government, including forecasting capacity of the MoF and line ministries, clear norms for expenditure forecasts, timely and reliable budget execution data, and strong Ministry of Finance, need to maintain aggregate fiscal discipline. While these set of core competencies are relatively well developed in Israel, there is still a room for enhancing the quality and lengthening time horizon of the MoF's macro-fiscal forecasts, as well as for enhancing the capacity of line ministries to produce reliable expenditure estimates and medium-term sectoral plans.

Figure 6. Institutional Underpinnings of Medium-term expenditure frameworks  
*Capable MoFs with clear procedures for dealing with new pressures*



40. An area of institutional development, entirely absent at present in Israel, concerns the process of arbitrating between competing priorities, while maintaining aggregate fiscal control. In other developed countries, this process typically combines input from line ministries, MoF and prime minister or president and is recognized by all as legitimate. In Netherlands, for example, these priorities are sorted out through a political agreement of the governing coalition, which fixes nominal expenditure ceilings for length of four years. In Sweden, these ceilings are fixed for the first two years with a third year added at each budget. Furthermore, once the priorities have been agreed and reflected in the ministerial ceilings, proper accountability arrangements are also needed to ensure that the line ministries respect their budgets and at the same time track progress towards meeting their targets. This is yet another area of institutional improvements in Israel.

### **E. Priorities for Institutional Improvements**

41. Comparisons with effective fiscal frameworks in other countries suggest that Israel would need to focus on building institutional underpinnings for full-fledged medium-term fiscal and expenditure frameworks. Key priorities in this area include:

- Developing a medium-term macro-fiscal framework

Efforts in this area include on-going modeling work to incorporate the implications of future demographic trends and to improve medium- and long-term macro-fiscal forecasts.

Macro-fiscal framework would also need to incorporate fiscal forecasts for at least budget years plus two or three additional years of rolling forecasts, casted in nominal terms.

- MTEF formulation needs to be based on a more adverse medium-term macro scenario, not the central case.

Fiscal implications of risks from macroeconomic shocks (e.g. adverse growth shock and its implication for the medium term framework) could be routinely assessed by means of sensitivity analysis, stress-testing of the macro-framework and possibly stochastic analysis.

Enhanced disclosure and management of other specific fiscal risks – from contingent liabilities, adverse demographic trends and natural disasters could further enhance the credibility of medium-term fiscal framework, therefore, ensuring aggregate fiscal discipline.

- Setting up good medium-term prioritization mechanisms to ensure discipline over sectoral spending commitments and high quality of public spending.

Because this process is largely non-existent in Israel, this could start with selecting a few big line ministries with the focus on strengthening the review process of existing spending commitments and new spending proposals.

With regard to existing expenditure commitments, it is important to ensure that medium-term prioritization process is based on ex-post expenditure assessment to ensure accountability.

One way to do that is to establish a dedicated unit charged with spending reviews which would define sectoral priorities and will become a key vehicle for reallocating spending.

Last but not least, it is also essential that this mechanism does not allow for inconsistency between aggregate spending limits and bottom up expenditure commitments resulting from these sectoral programs.

- Gradually require line ministries to build multi-year rolling MTEFs and establish multi-year ceilings for several line ministries.

These efforts would need to be accompanied by strengthening capacity of and creating incentives for line ministries to produce good budget estimates and to formulate their medium-term plans.

Once this capacity is in place, the MoF could consider granting more autonomy in formulation and execution of the multi-year sectoral spending plans.

## V. FINANCIAL STABILITY IN ISRAEL—A SYSTEMIC CONTINGENT CLAIMS PERSPECTIVE<sup>1</sup>

1. The recent global financial crisis spilled over into Israel as it did elsewhere, but with effects that appeared to be significantly different from many other cases. In particular, the impact on the banking system was limited overall. But despite the resilience of the Israeli banking sector, Israeli nonbank institutions and portfolios were on some key dimensions—including the complete closure of the corporate bond market which provides half of corporate credit and large withdrawals from mutual funds—as badly affected as those in the advanced world, if not more so.
2. While nonbank difficulties have since eased, along with the global recovery in asset prices, all supervisors in Israel have been reviewing this experience and drawing lessons for their work now. Nonbank supervisors have moved ahead quickly to strengthen a variety of matters related to the infrastructure and rules governing domestic securities, following the recommendations of the “Hodak committee” as well as their own diagnoses. And bank supervisors, notwithstanding their relative success, continue to examine how they can strengthen their identification of risk further.
3. In this regard, both are reviewing the role that can be played by Contingent Claims analysis in their toolkits. This attachment presents an initial review of the Israeli financial system from this perspective, not only to shed some further light on Israel’s passage through the global financial crisis, and its current exposures to key international risks, notably the GIPS. But it also thereby illustrates the strengths and appropriate use of the analysis as consideration is given by supervisors on how to use this instrument in their future work.

### A. Background

4. Central banks use a range of methods to monitor and assess the vulnerabilities and risks in the financial system, and the implications of these for the stability of individual institutions and for the system at an aggregate level. Standard methods include the monitoring and analysis of a wide variety of indicators of financial indicators of disequilibrium in asset prices, balance sheet vulnerabilities of financial institutions, businesses and households.<sup>2</sup> Commonly, such indicators are examined individually but with a qualitative piecing together of the evidence into an overall picture or assessment of the stability of the financial system. Such analysis can be conducted on a nearly real-time basis, and, importantly, combines quantitative information with expert judgment. Notwithstanding its expediency, it is difficult to use this approach to form a comprehensive quantitative assessment of financial system risk or stability from a macro-prudential perspective.

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<sup>1</sup> Prepared by Dale Gray, Andy Jobst, Scott Roger (all MCM), and Peter Doyle (EUR).

<sup>2</sup> See, e.g. IMF, 2006, *Financial Soundness Indicators Compilation Guide*, available at <http://www.imf.org/external/pubs/ft/fsi/guide/2006/index.htm>.

5. So far, however, most policy efforts have not focused in a comprehensive way on assessing network externalities caused by the interconnectedness within financial institutions and financial markets and their effect on systemic risk. In this regard, the size, interconnectedness, and complexity of individual institutions (with varying degrees of leverage and maturity mismatches) create vulnerabilities to system risk in the financial sector, which can adversely affect real economic activity in absence of sufficient redundancies.

6. Quantitative stress-testing analysis provides an additional important tool for quantitative analysis of financial system vulnerabilities.<sup>3</sup> This framework, which is still at a relatively early stage of development in Israel, uses balance sheet information of financial institutions to estimate their vulnerability to different kinds of shocks. The balance sheets of financial institutions may also be combined with balance sheet information for businesses and households to form a more in-depth picture of financial interlinkages across sectors. This balance sheet information is combined with information on some behavioral regularities, such modeling of non-performing loans ratios and losses given default, to capture the manner in which shocks propagate through balance sheets. Stress testing analysis provides a means of integrating several financial stability indicators into a coherent framework for assessing the quantitative impact on financial stability of a range of possible shocks.

7. Critically important though high quality stress testing is, it inevitably has important limitations. Stress tests cannot be carried out on a high frequency basis. Additionally, they generally perform better in analyzing the financial stability of individual institutions than the system as a whole, partly because the way in which institutions interact in financial markets is not typically built into such models but is crucial to the propagation of shocks. Similarly, these kinds of models typically do not include endogenous responses of financial institutions to shocks affecting their balance sheets. Consequently, they are better at capturing the immediate impact of shocks on the strength of the financial system than the dynamics of financial system responses to shocks and their interaction with the macroeconomy. Finally, such models are generally linear, so that they are not well-suited to capturing threshold effects which are commonly viewed as playing an important role in financial systems.

## **B. Contingent Claims Analysis (CCA)**

8. A more recent approach to assessing financial stability, which works to complement the analysis of stress testing exercises, is based on Contingent Claims Analysis (CCA). This uses the information embedded in market prices, together with balance sheet information on financial institutions, to assess the stability of financial institutions and financial systems as a whole.<sup>4</sup> CCA generalizes the option pricing theory pioneered by Black-Scholes (1973) and

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<sup>3</sup> See, e.g., IMF and the World Bank, 2003, *Analytical Tools of the FSAP* (available at <http://www.imf.org/external/np/fsap/2003/022403a.htm>), or Jones, Hilbers, and Slack, 2004, *Stress testing Financial Systems: What to do when the Governor calls*, IMF Working Paper 04/127 (available at <http://www.imf.org/external/pubs/ft/wp/2004/wp04127.pdf>).

<sup>4</sup> See, e.g., IMF, *Global Financial Stability Report: Responding to the Financial Crisis and Measuring Systemic Risks*, April 2009, Chapter 3; (available at <http://www.imf.org/External/Pubs/FT/GFSR/2009/01/index.htm>). Or



Merton (1974)<sup>5</sup> to determine the risk-adjusted balance sheet of firms, based on three principles: (i) the values of liabilities (equity and debt) are derived from assets and constitute the bankruptcy level (“default threshold”); (ii) liabilities have different priority (i.e. senior and junior claims); and, (iii) the value of assets—the present value of future income—follows a stochastic process. Assets (such as the present value of income flows and proceeds from asset sales) are stochastic and over a horizon period may be above or below promised payments on debt which constitute a default barrier. As the value of total assets declines, the value of risky debts, including subordinated debt, and junior claims, such as equity, declines, and spreads on risky claims rise.

9. Uncertain changes in future asset value, relative to the default barrier, determine risk of default, which occurs when assets decline below the barrier. When there is a chance of default, the repayment of debt is considered “risky,” to the extent that it is not guaranteed in the event of default (risky debt = risk-free debt minus guarantee against default). If all or some of the principal is protected, the discounted value of the economic cost from insuring against default can be quantified as expected loss borne by a third-party guarantor, such as the government.<sup>6</sup>

10. In the CCA, the equity can be modeled and calculated as an implicit call option on the assets, with an exercise price equal to the promised debt payments,  $B$ , maturing in  $T-t$  periods. The risky debt is equivalent in value to default-free debt minus a guarantee against default. This guarantee can be calculated as the value of a put on the assets with an exercise price equal to  $B$ . In the CCA framework, the value of the equity can be computed as the value of an implicit call option and the value of the debt guarantee can be modeled as an implicit put option. The balance sheet components can be calibrated by using the value of market capitalization, the volatility of equity, and information from the balance sheet to define the “default barrier” of financial distress.

### C. CCA and Israel

11. In this note, the CCA methodology is applied to the Israeli financial system. Default risks and expected losses are calculated for individual banks and insurers. Additionally, the riskiness of the banking system as a whole is evaluated, which informs a measurement of the

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Gray, D., A. Jobst and S. Malone, 2010, “Quantifying Systemic Risk and Reconceptualizing the role of Finance for Economic Growth,” *Journal of Investment Management*, 8(2) 90–110.

<sup>5</sup> Black, F., and M. Scholes, 1973, “The Pricing of Options and Corporate Liabilities,” *Journal of Political Economy*, 81(3), 637–59, and Merton, R., 1974, “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,” *Journal of Finance*, 29 (2) 449–70.

<sup>6</sup> The guarantee can be held by the debt holder, in which case it can be thought of as the loss given default (as in the case of uninsured subordinated debt holders) or by a third party guarantor, such as the government (for example, bank deposits are often partially guaranteed by a state deposit insurance, such as the FDIC in the United States). The value of such government guarantees can be measured with implicit put options (Merton, 1977).

contribution of each major financial institution to systemic risk. Finally, potential spillover effects from changes in the sovereign risk of several European “peripheral” countries on systemic risk of the Israeli banking sector are assessed.

### **Banking sector analysis**

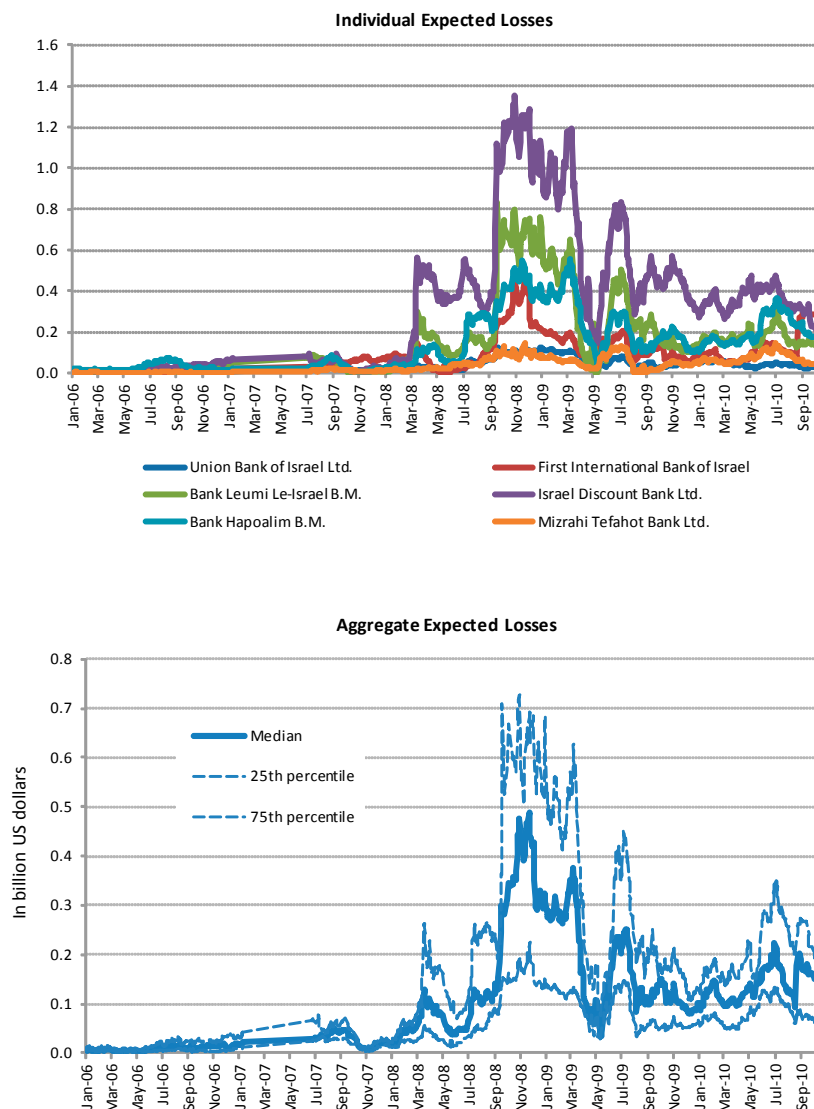
12. The analysis of the banking sector covers the six largest Israeli banks. The CCA model, using market and balance sheet information, allows for the calculation of the time pattern of the expected losses for each bank (based on the implicit put option value over a time horizon of one year) between January 2006 and October 2010.

13. Figure 1 shows a sharp increase in expected losses in the Israeli banking system beginning in March–April 2008, followed by a further major escalation in risk in October. Risks remained high through until April–May 2009, before beginning to decline. However, the figure also shows that expected losses remain well above pre-crisis levels. With regard to the timing of these episodes of heightened stress, developments in the Israeli banking system echo those in other advanced countries. However, it is noteworthy that the relative size of expected losses does not correspond closely to the relative sizes of the banks—expected losses by Israel Discount Bank and First International Bank are much larger than their relative sizes would suggest.

### **Insurance sector analysis**

14. The CCA framework can also be applied to the non-bank sector, and its interactions with the banking system, but different risk profiles of insurance companies and data constraints limit an integrated analysis at this point. However, the approximate sum of one-year losses for the insurance companies (life and two non-life insurers) using Moody’s KMV data reveals that expected losses in the insurance sector stood at about U.S.\$0.7 billion (or two-thirds of the simple sum of banking system losses).

Figure 1. Individual Bank Expected Losses (US\$ billions)



#### D. Measuring Systemic Solvency—Systemic CCA

15. Our interest in systemic risk stemming from multiple institutions with “too-big-to-fail” properties (and their contingent liabilities) warrants measuring aggregate financial sector risk. A suitable assessment of systemic risk stemming from multiple institutions warrants measuring joint default risk, which entails a non-trivial aggregation problem. Since the simple summation of implicit put options would presuppose perfect default correlation, the correct estimation of aggregate risk requires knowledge about the dependence structure of individual balance sheets.

16. While it is necessary to move beyond “singular CCA” by accounting for the dependence structure of individual balance sheets and associated contingent claims, the estimation of systemic risk through correlation, however, becomes exceedingly unreliable in the presence of “fat tails.” Conventional correlation measurement is ill-suited to systemic risk analysis in which extreme events occur jointly and in a non-linear fashion. This is especially true in times of stress, when default risk is highly skewed, and higher volatility inflates conventional correlation measures automatically (as covariance increases disproportionately to the standard deviation). In these instances, default risk becomes more frequent and severe than suggested by the standard assumption of normality. Accounting for dependence between higher moments of changes in asset values of multiple entities can deliver important insights about joint tail risk, given that large shocks are transmitted across entities differently than small shocks.

17. One way forward is to view the banking sector as a *portfolio of individual contingent claims* (with individual risk parameters),<sup>7</sup> whose joint expected losses are defined as the multivariate density of each financial institution’s individual market-implied expected losses and their time-varying dependence structure—*systemic* contingent claims analysis (“Systemic CCA”).<sup>8</sup>

18. The Systemic CCA framework helps estimate the magnitude of systemic financial risk. This aggregation technique is a logical extension to the individual bank analysis by combining CCA-derived risk-adjusted balance sheets of individual financial institutions and the dependence between them in order to quantify the default risk jointly posed by financial institutions. Systemic CCA generates estimates of the joint market-implied expected losses by combining the individual risk-adjusted balance sheets of financial institutions and the dependence between them. As opposed to the traditional (pairwise) correlation-based approach, this method of measuring systemic risk is better suited to analyzing extreme linkages of multiple (rather than only two) entities, because it links the univariate marginal distributions of expected losses (and associated liabilities) in a way that formally captures both linear and non-linear dependence in joint asymptotic tail behavior over time. Based on individual estimates of contingent liabilities from explicit and implicit guarantees, this aggregation technique utilizes a novel application of extreme value theory (EVT)<sup>9</sup> in order to

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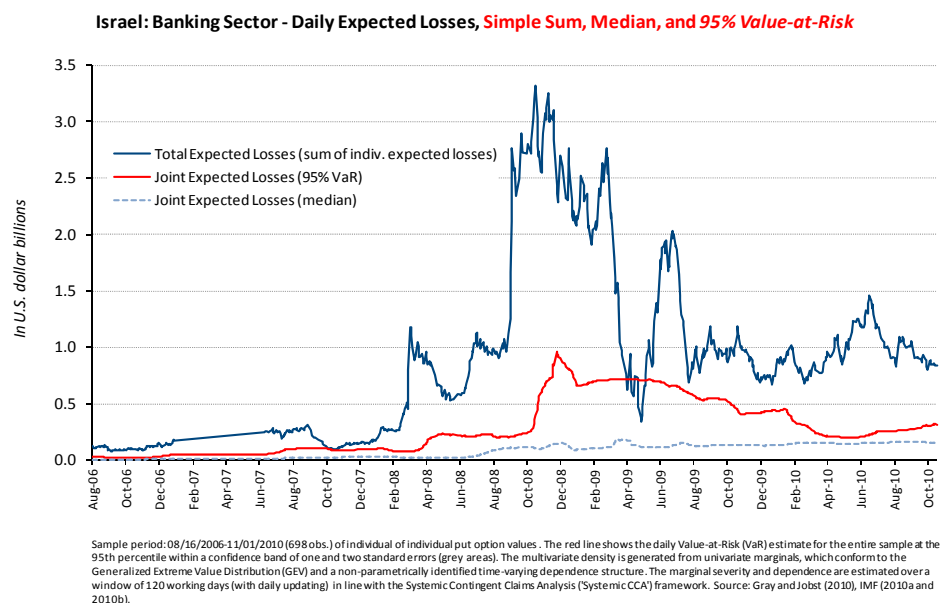
<sup>7</sup> The aggregation of contingent claims (rather than their underlying assets and liabilities) is crucial to preserve individual balance sheet risk.

<sup>8</sup> Gray, D., and A. Jobst, 2010, “Systemic Contingent Claims Analysis (Systemic CCA) – Estimating Potential Losses and Implicit Government Guarantees to Banks,” forthcoming IMF Working Paper; Gray, D., and A. Jobst, 2010, “Using the CCA Framework to Estimate Potential Losses and Implicit Government Guarantees to the U.S. Financial Sector,” United States: Publication of Financial Sector Assessment Program Documentation - Technical Note on Stress Testing, IMF Country Report No. 10/244 (July 30) , 58-83; Gray, D., and A. Jobst, 2010b, “New Directions in Financial Sector and Sovereign Risk Management, *Journal of Investment Management*, 8(1), 23–38.

<sup>9</sup> EVT is a useful statistical concept to study the tail behavior of heavily skewed data, which specifies residual risk at high percentile levels through a generalized parametric estimation of order statistics.

generate a multivariate limiting distribution that formally captures the potential of joint extreme realizations of expected losses. Moreover, this approach also helps indicate the contribution of individual institutions to expected losses over time depending on their size and interconnectedness.

Figure 2. Sum of Losses, Median and 95<sup>th</sup> percentile VaR of Systemic Expected Losses



19. Figure 2 shows the results of applying the Systemic CCA methodology to the six main banks in Israel by estimating the marginal severity of individual expected losses and their dependence structure over a rolling window of half a year:

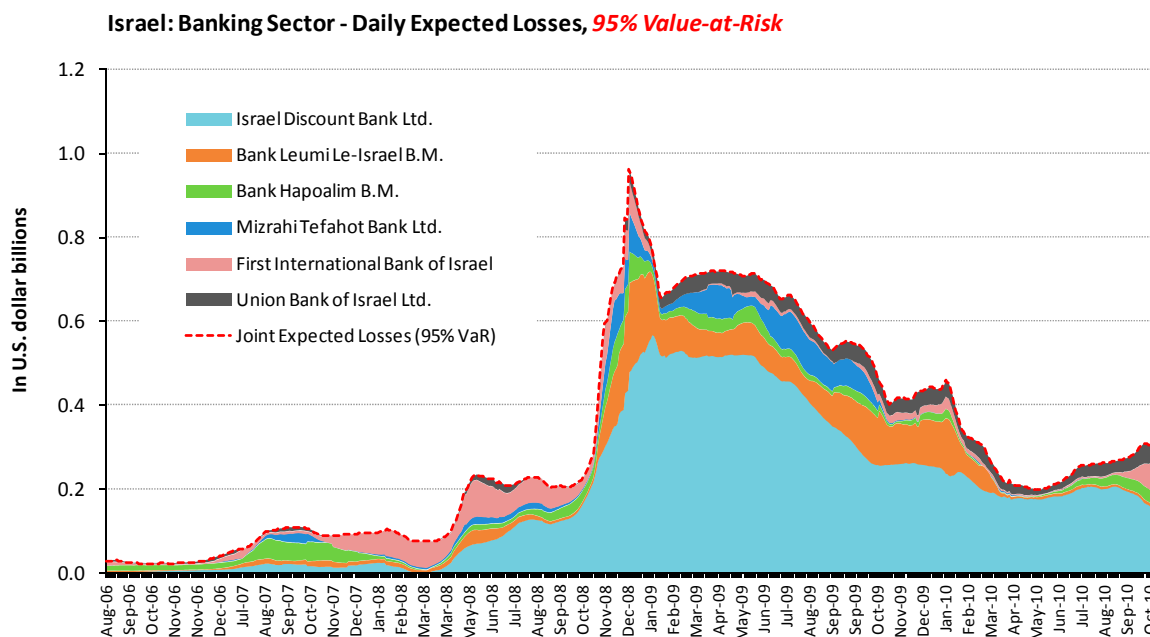
- the simple sum of expected losses of the six banks (assuming perfect correlation of shocks);
- the median (expected) *joint* losses derived from the multivariate distribution of losses; and,
- the 95th percentile VaR (Value-at-Risk) of these joint losses. The 95th percentile line can be interpreted as a five percent chance that losses will be equal to or greater than the level shown. We can see that there was a five percent chance of losses of US\$1 billion or greater (over a one-year horizon) in December 2008, which have declined to one-fourth to one-third of that level from June to October 2010. Average losses are around one-fifth (US\$200 million) in 2010, relatively stable.

20. Estimates of the 95% VaR of expected losses in the banking system (as an indication of systemic risk) differ significantly from the simple summation of expected losses might suggest. Interestingly, it suggests a much more moderate increase in expected systemic losses, and that the real spike in expected losses occurred only in the October-December 2008 period, with only a gradual decrease in expected losses thereafter. The fact that

systemic losses are well below aggregated individual bank losses indicates negative covariance within the system—when one bank loses, another gains—suggesting a degree of diversification of bank portfolios, imparting resilience to the system as a whole. Israel Discount Bank has the highest contribution to systemic risk from August 2006 to October 2010 (see Figure 4).

21. The CCA estimates of expected systemic banking losses for Israel are substantially lower than in many other countries. Figure 4 compares the evolution of expected losses in Israel with expected losses in European countries. The striking feature of the figure is that Israel's expected losses are measured on the right-hand scale, while European losses are on the left-hand scale—100 times greater. Even when these are scaled relative to GDP, the estimated losses in Israel are well below those elsewhere.

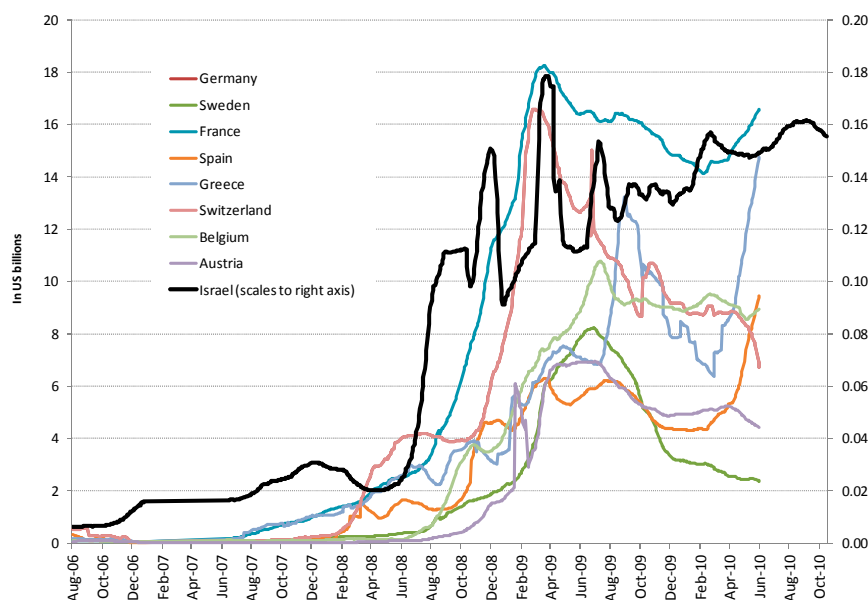
Figure 3. Individual Contribution to Systemic Risk (95% VaR).



22. The Systemic CCA methodology can also be used to estimate the magnitude of explicit or implicit guarantees to bank debt holders. If such guarantees are believed to exist, the benefit will accrue to debt holders, but will not significantly affect equity holders during times of stress. Moreover, a bank's credit default swap (CDS) spread will capture only the expected loss retained by the bank after accounting for the expected government guarantee. This implies that the value of the guarantee can be inferred from the difference between the value of a put option derived from the bank's equity price and that of a put option derived from the bank's senior CDS spread. In absence of liquid CDS spreads for Israeli banks, it is

assumed that the Israeli government would cover 100 percent of the systemic losses. In fact, results in other countries show that the public sector cost from systemic risk events ranges between 70 and 90 percent of expected losses.

Figure 4. Systemic Risk (50th percentile) – Cross-Country Comparison.



23. The joint expected losses covered by the government can also be used to estimate a fair value guarantee or insurance fee that would offset this indirect subsidy.<sup>10</sup> Assuming that all expected losses in a systemic distress event will accrue to the public sector, an average fair value “through-the-cycle” systemic risk surcharge for the major Israeli banks would likely range between 3.9 and 13.8 basis points (50th and 95th percentile) depending on the desired degree of statistical confidence (Figure 5). Banks with higher expected losses could expect to face higher fees, while less risky banks would face smaller fees.<sup>11</sup>

<sup>10</sup> Calculations based on Gray, D., and A. Jobst, 2010, “Systemic Contingent Claims Analysis (Systemic CCA) – Estimating Potential Losses and Implicit Government Guarantees to Banks,” forthcoming IMF Working Paper; Gray, D., and A. Jobst, 2010 a, “Using the CCA Framework to Estimate Potential Losses and Implicit Government Guarantees to the U.S. Financial Sector,” United States: Publication of Financial Sector Assessment Program Documentation - Technical Note on Stress Testing, IMF Country Report No. 10/244 (July 30) , 58-83; Gray, D., and A. Jobst, 2010b, “New Directions in Financial Sector and Sovereign Risk Management, *Journal of Investment Management*, 8(1), 23–38.

<sup>11</sup> This range is low compared to other countries. For instance, the application of this approach to the U.S. financial sector generated fee estimates of at least 40 basis points on average.

Figure 5. Systemic Risk from Expected Losses — Fair Value Guarantee Fee (FGF)  
(In basis points, one-year risk horizon)

	Israel Discount Bank Ltd.	First International Bank of Israel	Bank Hapoalim B.M.	Union Bank of Israel Ltd.	Bank Leumi Le- Israel B.M.	Mizrahi Tefahot Bank Ltd.	Average
Pre-Crisis (Aug. 16, 2006-June 30, 2007)							
at statistical confidence of							
50 percent	0.6	0.4	1.0	1.5	0.2	0.0	0.5
95 percent	1.2	3.1	3.8	8.4	0.5	0.4	1.7
Crisis Period 1 (July 1, 2007-Sept. 14, 2008)							
at statistical confidence of							
50 percent	1.7	4.1	1.2	1.2	0.9	0.3	1.4
95 percent	6.5	20.2	4.8	5.4	1.8	4.0	5.7
Crisis Period 1 (Sept. 15-Dec. 31, 2008)							
at statistical confidence of							
50 percent	5.9	4.7	6.3	2.0	5.3	1.0	5.1
95 percent	46.1	21.4	10.2	10.0	14.2	18.5	24.1
Crisis Period 1 (Jan. 1-Sept. 30, 2009)							
at statistical confidence of							
50 percent	5.4	7.6	9.9	3.5	3.6	1.3	5.4
95 percent	66.9	2.2	5.7	45.5	10.5	22.7	28.1
Crisis Period 1 (Oct. 1, 2009-Feb. 28, 2010)							
at statistical confidence of							
50 percent	14.2	1.4	2.5	1.8	2.0	0.3	5.4
95 percent	34.1	6.7	2.9	42.8	13.3	3.4	16.8
Crisis Period 1 (March 1-June 30, 2010)							
at statistical confidence of							
50 percent	15.7	0.5	2.5	8.6	2.0	0.2	5.9
95 percent	24.9	1.3	0.4	28.0	2.1	0.5	9.0
Crisis Period 1 (July 1-Nov. 1, 2010)							
at statistical confidence of							
50 percent	16.7	1.8	3.4	7.1	1.6	0.2	6.2
95 percent	26.3	8.6	4.8	42.8	0.9	0.2	10.7
"Through-the-Cycle" (Aug. 16, 2006-Nov. 1, 2010)							
at statistical confidence of							
50 percent	7.0	3.8	3.9	3.3	2.1	0.5	3.9
95 percent	28.7	11.0	4.8	26.6	5.8	7.9	13.8

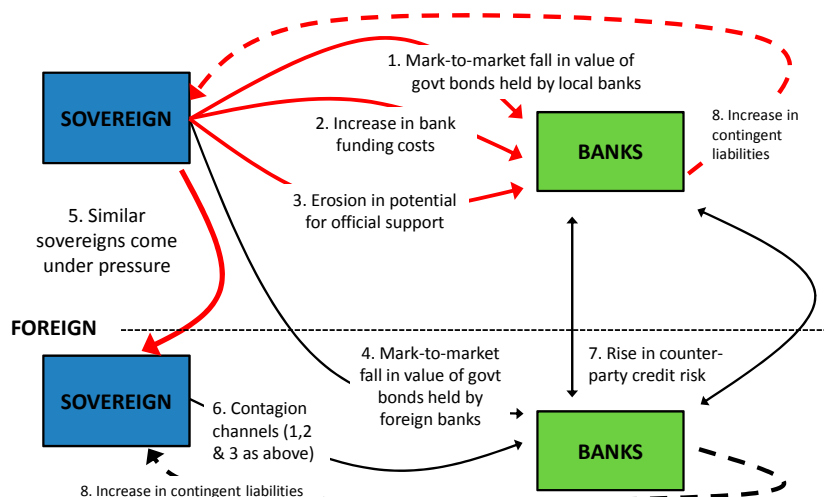
Note: This calculation assumes that all expected losses from joint distress are transferred to the public sector and represent contingent liabilities, i.e., there is a 100 percent government guarantee. Due to the non-linear aggregation of systemic risk, different degrees of contingent liabilities, say 50 percent, cannot be derived directly from the results but have to be calculated separately.

## E. Systemic Solvency Risk and Sovereign Risk Spillovers

24. The Systemic CCA framework can also be used to analyze inward spillovers into the financial system from elsewhere in the global financial system by examining the dependence between joint expected losses and changes in default risk abroad. The recent crystallization of sovereign risk and related spillover effects have led to a renewed deterioration of market conditions notwithstanding a number of encouraging market developments. Exposures to the European “peripheral” countries is a matter of particular current focus globally. There are mounting concerns surrounding the fiscal positions of sovereigns that have borrowed excessively to stabilize their financial systems and the related potential for contagion across the most vulnerable countries.



Figure 6. Stylized Example of Sovereign-Banking Sector Spillovers

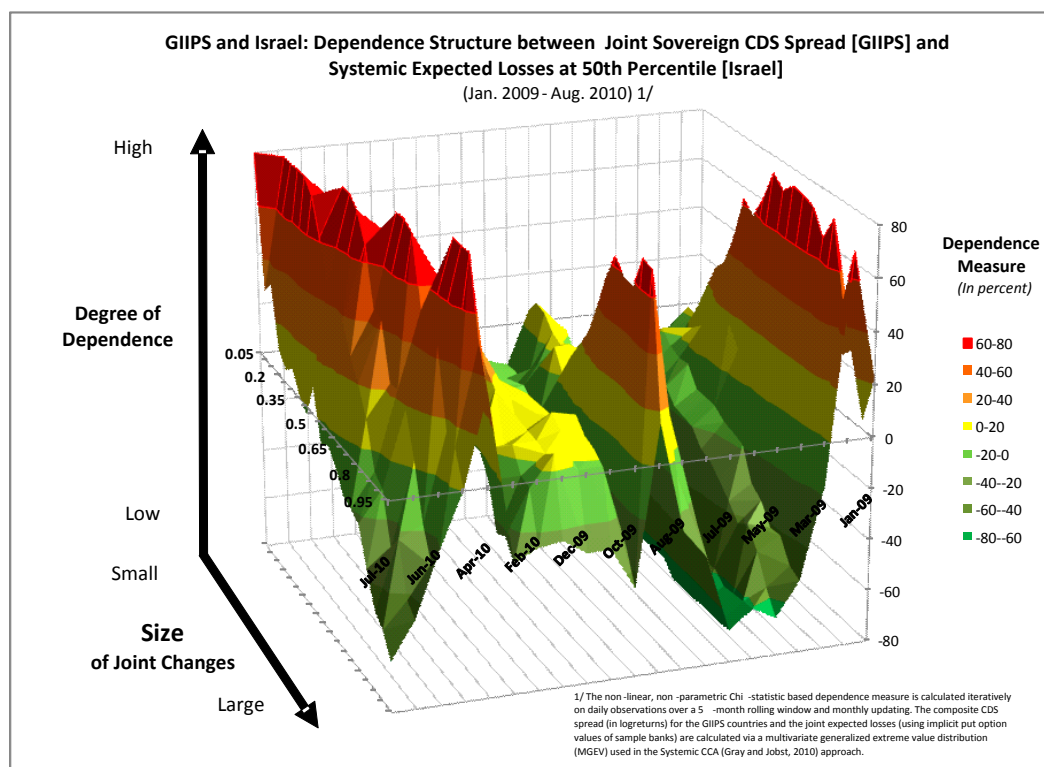


25. Figure 6 shows the ways in which sovereign and banking sector risk can interact and potentially lead to a destabilization process. If sovereign spreads increase, so do bank spreads because (i) the credibility of sovereign guarantees decreases (alpha goes down); (ii) the implicit bank put option could increase as the value of the bank's holdings of government debt decrease; (iii) the bank default barrier may increase due to higher borrowing costs (and if banks fail to rollover debt). Prospects of a much more fragile banking system can feed back on sovereign spreads via several possible channels, e.g., an increasing large bank guarantee/bailout costs that may overwhelm the budget, reduced ability of sovereigns to borrow from banks and potential crowding out effects.

26. Although balance sheet information suggests that Israeli banking system is little exposed to the recent escalation of sovereign risk, transmission channels via market prices indicate considerable potential for spillovers. An examination of the relation between the systemic expected losses of the Israeli banking sector and the sovereign default risk of the GIIPS (Greece, Ireland, Italy, Portugal and Spain) countries indicates that April 2010 marked a period of the greatest potential of extreme cross-border linkages in response to deteriorating sovereign risk in the European periphery (see Figure 7a).

27. In general, the sensitivity of individual expected losses of Israeli banks to changes in the sovereign risk of GIIPS countries has been low over the last two years, but there have been episodes of higher risk of spillovers during the first half of 2009 and since the onset of the escalating default risk in 2010. Moreover, Israeli banks appear less susceptible to extreme movements in the sovereign risk of GIIPS countries (see Figure 7b).

Figure 7a. Dependence structure between joint sovereign default risk in GIIPS countries and systemic risk of the Israeli banking sector.



Such contagion effects for large shocks (tail risk) have abated since then, but remain elevated. In fact, a simple impulse-response analysis (based on a vector-autoregressive (VAR) specification) shows that the systemic risk from joint expected losses of the banking sector increases by more than US\$40 million in response to merely a one percent change in joint GIIPS CDS spreads (see Figure 7b).

Figure 7b. Impulse response of systemic risk from expected losses of the banking sector to changes in joint default risk of GIIPS countries (based on VAR with three lags).

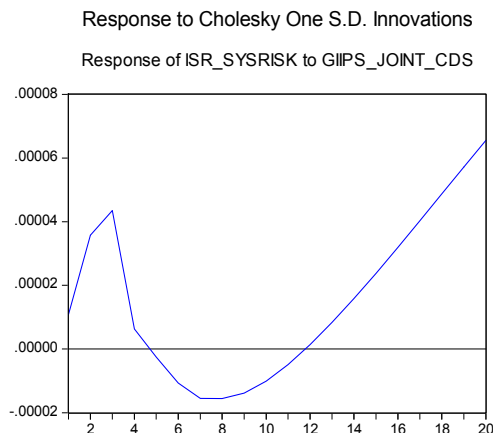
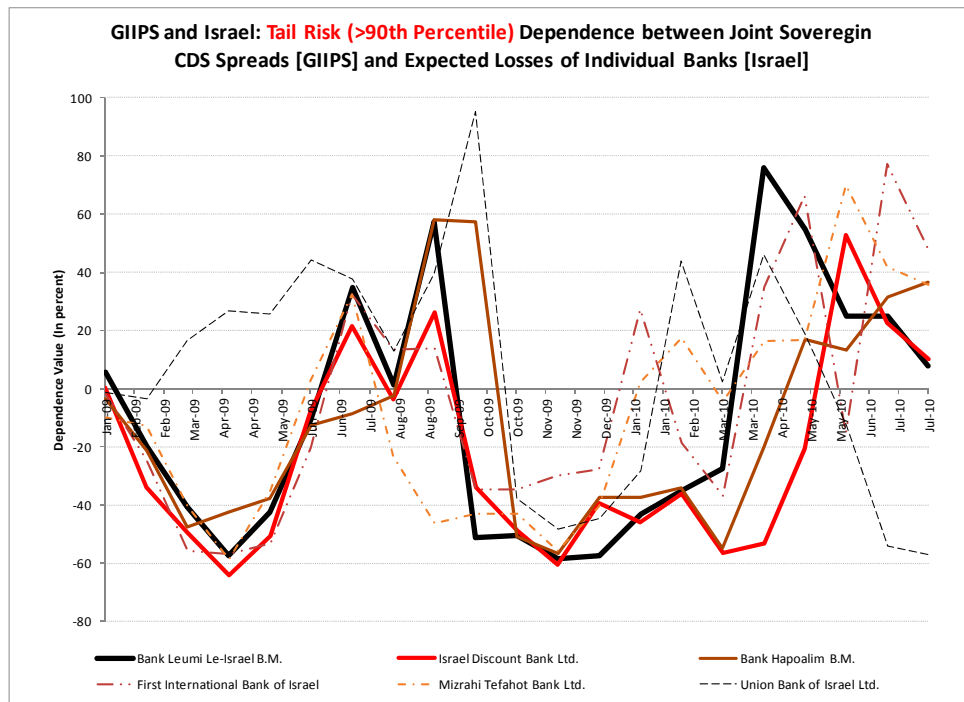
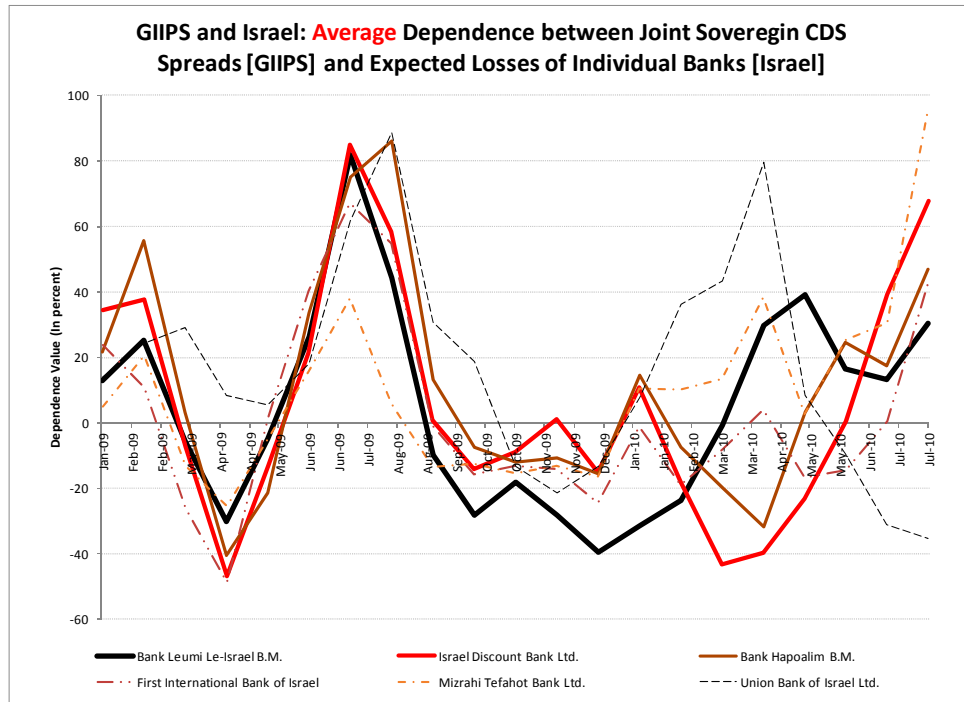


Figure 7c. Dependence structure between joint sovereign default risk in GIIPS countries and systemic risk of the Israeli banking sector.



## F. Conclusion

28. The CCA framework provides flexible foundation for financial stability analysis using a combination of market data and balance sheet information. Amid greater supervisory focus on macro-financial linkages, this approach offers an expedient and tractable means of illustrating potential financial sector vulnerabilities and the dynamics of systemic risk.

29. Thus, it could be usefully integrated with other supervisory tools, notably stress testing. While stress test typically examines one scenario, the CCA approach provides a “weighted average” of anticipated risk scenarios currently envisaged by markets and reflected in the market data used as model inputs.

30. The CCA approach provides useful insights into the behavior of the Israeli financial system before and during the global recession. It underscores that the banking system was, by international standards, relatively robust in the face of those shocks. But it also highlights that among non-banks, the insurance sector’s exposures were large—as much as 2/3 of those of the entire banking system. And it cautions that the banking system is exposed, albeit moderately, to the sovereign stresses in Europe despite limited direct balance sheet exposures. This underscores the need for strong supervisory arrangements in Israel for banks and for non-banks.

31. However, both traditional stress testing and CCA have their advantages and limitations:

- a. Both may fail to consider the extent of underlying risks if insufficiently adverse scenarios are considered. This is particularly apparent from the low risk indicators the CCA work shows in the pre 2008 period—in Israel and elsewhere, as well as the strong results delivered by the pre-crisis stress testing that was done internationally.
- b. A stress test will typically not identify when institutions/regulatory actions are systemic, whereas the CCA can provide key insights into that. Furthermore, it can provide insights into that which reflect that systemic status can change radically in short periods of time—as the market experience in the context of the Lehman’s closure illustrates. But for this to be identified, the CCA analysis would need to be monitored on a quasi continual basis, notably when risks elevate even to moderate degrees.
- c. Stress testing and CCA analysis can both provide useful input into determination of appropriate capital and liquidity requirements. Stress testing can anticipate evolution in capital levels under adverse scenarios. And where these results are published, market reactions as summarized in CCA analysis can help identify market views of the capital levels realized in such adverse scenarios. However, neither instrument used separately, nor both used together, can directly resolve determination of capital adequacy requirements.
- d. It would be very useful, going forward, to routinely use the systemic CCA model, with a factor model, to stress test the system and simultaneously use

detailed supervisory data (much of it confidential) to compare loss estimates and risk indicators from supervisory data with the market and balance sheet risk indicators from the CCA-type models to see if risks are similar, and which risks are anticipated by market participants and which are not. Comparison of these different methods will be useful for surveillance and for policy making.

32. In summary, there is a role for both stress testing and CCA analysis in supervisory work. They complement and can inform each other in critical areas. Israel is encouraged to move ahead on both fronts as part of broader efforts to strengthen supervision.