

Moreover, the Financial Stability Board (FSB) provided a policy framework to address the systemic and moral hazard risks associated with global systemically important financial institutions (G-SIFIs), aiming to reduce the probability and severity of the failure of large financial institutions, and prevent a systemic crisis. The policies include (1) the establishment of effective resolution regimes for failing financial firms; (2) requirements for recovery and resolution planning for G-SIFIs; (3) requirements for a 1%-2.5% capital surcharge for G-SIFIs; and (4) more intensive and effective supervision of all G-SIFIs. This framework was endorsed at the 2010 G20 Seoul summit, and the implementation of these measures will begin from 2012. Full implementation is targeted for 2019.

Furthermore, in response to the global financial crisis, US and European financial supervisors successively required domestic banks to conduct stress tests and publish the test results in order to assuage market fears about the soundness of financial institutions in some jurisdictions or countries, and to rebuild market confidence. In light of these recent developments, the stress tests have drawn more attention. In addition, according to their responsibility of safeguarding financial stability, central banks have recently become devoted to developing adequate stress testing frameworks that are able to assess the vulnerabilities and the risk-bearing capability of a financial system. In this context, macro stress tests are regarded as one of the most crucial assessment tools. In Taiwan, in line with international regulatory trends, the FSC requires domestic banks to conduct a stress test at least annually under pillar 2 of Basel II, and to submit the test results to the FSC to serve as a reference for financial supervision. Meanwhile, in accordance with the operational objective that aims at promoting financial stability, the CBC recently developed two macro stress testing models that focus on market and credit risks, respectively, with intent to assess system-wide financial soundness and shock-bearing capability under alternative economic scenarios (Box 1).

2.2 Domestic economic and financial conditions

Taiwan's economy grew at a decelerated pace in 2011 compared to the previous year due to a higher base effect. During the same period, the price level rose moderately. Short-term external debt servicing ability remained strong on the back of a continued surplus in the current account and ample foreign exchange reserves. The scale of external debt continued to expand, while overall external debt servicing ability stayed robust. The government's fiscal deficit shrank, whereas total government debt continuously mounted.

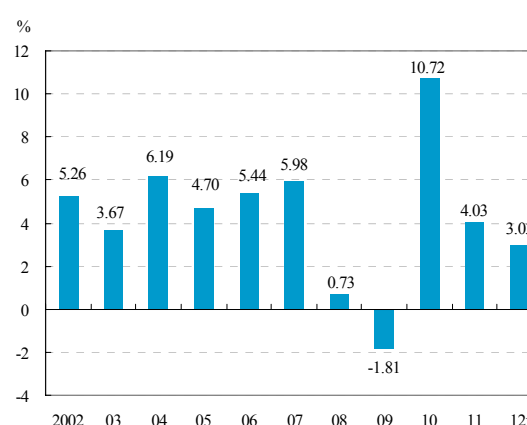
Domestic economic expansion decelerated

In the first half of 2011, as exports expanded steadily on account of stably growing foreign demand from emerging economies and upward momentum in private investment, coupled with mild growth in private consumption as a result of improving employment, rising salaries and buoyant financial markets, the economic growth rate registered 6.62% in Q1 and slightly declined to 4.52% in Q2. As for the second half of the year, the recovery momentum of the global economy became sluggish, resulting in continuously shrinking exports. Moreover, dull stock market performance and shrinking financial wealth also partially weakened the sustainability of private consumption. Meanwhile, private investment saw a slowdown due to moderating external demand. As a result of these unfavorable economic conditions, combined with a higher base in the previous year, the economic growth rates of Q3 and Q4 declined to 3.45% and 1.85%, respectively. The DGBAS statistics stated that the annual economic growth rate dropped to 4.03% in 2011, exhibiting a significant decrease from 10.72% a year earlier (Chart 2.12).

In order to alleviate the adverse impact from sluggish Western economies, the Executive Yuan proposed an “Economic Climate Response Program” in November 2011. Under this Program, short-term countercyclical measures came into effect. Moreover, the Executive Yuan further established the “Global Economic Climate Response Group” with the purpose of improving the ability to respond to global economic fluctuations and developing strategies to reshape Taiwan’s economic structure.

In 2012 Q1, as a consequence of dwindling exports and contracting private investment, preliminary statistics from the DGBAS indicated that the economic growth rate was merely 0.39%. Looking ahead, an improving global economy and recovery of the semiconductor industry are expected to be beneficial to a rebound in exports and more industrial investment. However, rising crude oil and electricity prices may lift the overall price level up and may partially offset economic growth by way of a restraint on private consumption. Thus, the DGBAS

Chart 2.12 Economic growth rates in Taiwan



Note: Figure for 2012 is forecast by DGBAS.
Source: DGBAS.

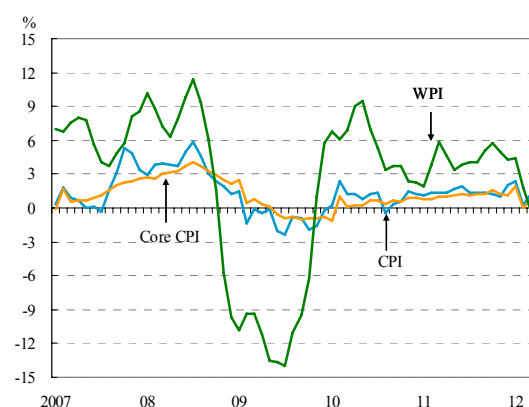
forecast Taiwan's economic growth rate would decline to 3.03%³² in 2012 (Chart 2.12). Moreover, although the European sovereign debt crisis was temporarily relieved after a second bailout was offered to Greece,³³ US and European peripheral countries' sovereign debt strains have not been properly solved. Other negative factors, including the unstable situation in the Middle East which could lead to global oil price spikes, Mainland China's economy possibly experiencing a hard landing, and the potential recession of the euro area, raise uncertainties concerning the vitality of the global economic recovery, and the ongoing impact on Taiwan's economy is worth close attention.

Domestic prices rose modestly, while inflationary pressures gradually mounted

With still-elevated international prices of raw materials, the WPI inflation rate trended up through 2011 Q1 and hit a peak of 5.82% in March. Afterwards, the easing of the international prices of raw materials and appreciation of the NT dollar exchange rate against the US dollar together brought the WPI inflation rate down significantly (Chart 2.13). As a result, the annual WPI inflation rate registered 4.32% in 2011, lower than the 5.46% recorded a year earlier.

Driven by climbing retail prices of gasoline and some consumer goods such as food, the CPI inflation rate gradually moved up in the first half of 2011. While international prices of raw materials declined and the price of fruits and vegetables remained stable owing to good weather, headline (CPI) inflation in the second half of 2011 was relatively mild. Although higher than the 0.96% and 0.44% logged a year earlier, the average CPI and core CPI inflation rates of 2011 were 1.42% and 1.13%, respectively. For 2012, the average WPI inflation rate from January to April continuously dropped to 1.31%, and the average CPI and core CPI inflation rates declined to 1.32% and 0.87%,³⁴ respectively, over the same period, revealing that price increases turned moderate in the earlier part of 2012 (Chart 2.13).

Chart 2.13 Consumer and wholesale price inflation rates



Note: Figures are measured on a year-on-year change basis.
Source: DGBAS.

³² The figures are based on a DGBAS press release on 25 May 2012.

³³ In March 2012, private bondholders agreed to a restructuring deal with Greece's government, resulting in a €107 billion write-off of Greek debt and a second €130 billion bailout from the European Union.

³⁴ The figures are based on a DGBAS press release on 7 May 2012.

With regard to 2012 Q1, as the global supply risk of crude oil further ascended in line with the instability in both North Africa and the Middle East, inflationary pressures relating to energy-related products ratcheted up. Furthermore, Taiwan's government announced a "Gasoline And Electricity Price Rationalization Policy" in April 2012 in order to cope with soaring global oil prices and years of low domestic electricity rates. It was proclaimed that electricity rates would be adjusted in three stages starting in June, which might lead to volatility in the consumer price level. However, inflationary pressures are expected to ease due to the following influences: declining global demand has lowered the prices of agricultural and industrial raw materials; domestic housing rents have remained stable; and an Executive Yuan panel charged with monitoring and stabilizing retail prices has urged each department to promote relevant measures. Therefore, the DGBAS projects the annual CPI and WPI inflation rates in 2012 to register 1.84% and 1.49%, respectively.³⁵

The CBC raised policy rates twice and then kept them unchanged

In the first half of 2011, global economic growth was robust and the domestic economy grew steadily. As market interest rates moved up gradually, along with heightened inflationary pressures, the CBC twice raised its policy rates by 0.125 percentage points in March and June to contain inflation expectations (Table 2.1).

However, during the second half of 2011, the impact of the European sovereign debt crisis was no longer confined to the financial sector but also spilled over to the real sector. Moreover, the US economy continued to be mired in a political stalemate over fiscal consolidation, a faltering housing market and high unemployment. These lingering concerns combined to make international financial markets turbulent. Such global economic and financial uncertainties have increased, and this may adversely affect Taiwan's economic growth. However, at the same time, inflation expectations have abated. Against this backdrop, the CBC decided to keep policy rates unchanged on three occasions in order to ensure price and financial stability, and further sustain sound economic growth.

Table 2.1 CBC policy interest rates

Effective date	Discount rate	The rate on accommodations with collateral	The rate on accommodations without collateral
1 July 2011	1.875	2.250	4.125
1 April 2011	1.750	2.125	4.000
31 Dec. 2010	1.625	2.000	3.875
1 Oct. 2010	1.500	1.875	3.750
25 June 2010	1.375	1.750	3.625
19 Feb. 2009	1.250	1.625	3.500

Source: CBC.

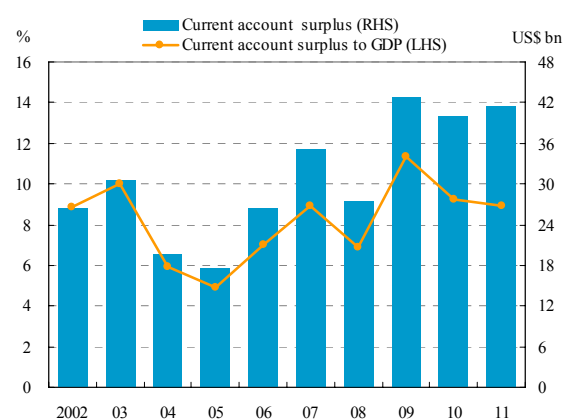
³⁵ See Note 32.

Current account surpluses persisted and foreign exchange reserves stayed abundant

In 2011, the rise in exports was larger than that in imports, making Taiwan's merchandise trade surplus trend up. Moreover, travel income markedly increased and resulted in a surplus in services. Hence, the annual current account surplus reached US\$41.6 billion, or 8.91% of annual GDP³⁶, increasing by US\$1.7 billion or 4.29% compared to 2010 (Chart 2.14). As for the financial account, in 2011, direct investments and portfolio investments both saw net outflows. The capital outflows on the financial account were mainly contributed to by a considerable expansion of business activities in Mainland China by Taiwanese companies and foreign investors' sales of stocks and government bonds, despite the fact that foreign stock certificate redemptions and spillovers from the European sovereign debt crisis brought about some capital inflows. During the same period, other investments³⁷ somewhat offset the above-mentioned capital outflows effect, but the annual balance of outflows in the financial account still registered US\$32.2 billion, notably higher than US\$0.3 billion the previous year. With the current account surplus and sharp outflows in the financial account, the balance of payments surplus registered US\$6.2 billion in 2011, a significant decrease of 84.47% from a year earlier.

In the first half of 2011, the steady balance of payments surplus together with continuously accumulated earnings on investments made with foreign exchange reserves contributed to ascending foreign exchange reserves, which reached US\$400.8 billion in July. However, as a result of net stock selling by foreign institutional investors and foreign stock certificate redemptions by domestic investors due to the tepid global economy and European sovereign debt crisis, foreign exchange reserves declined slightly to US\$385.5 billion at the end of 2011, resulting in an increase of only 0.93% compared to the previous year. However, at the end of April 2012, the number had climbed back to

Chart 2.14 Current account surplus



Note: Current account surplus and GDP are annual figures.
Sources: CBC and DGBAS.

³⁶ For the ratio of current account deficit to GDP, the cutoff point for risk is 3%. A country in which the reading is greater than 3% and has risen by at least 5 percentage points from the previous year is considered to be at relatively high risk.

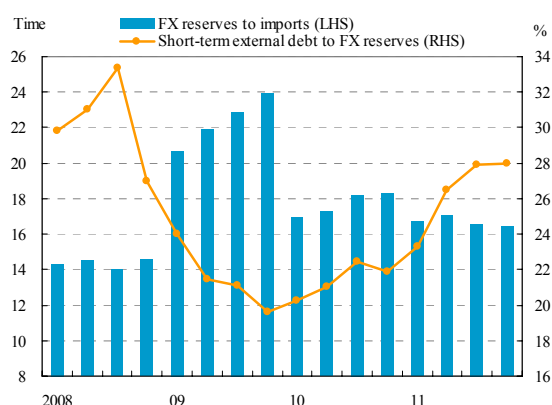
³⁷ Two parts mainly contributed to the net inflows from other investment in 2011. In the banking sector, it included the redemption of foreign loans and a rise in both the inbound remittance of funds from banks' foreign branches and the deposits received from non-residents. In the private sector, it resulted from the withdrawal of foreign deposits.

US\$395.1 billion, reflecting ample foreign exchange reserves. Nevertheless, the ratio of foreign exchange reserves to imports declined to 16.44 months,³⁸ led by growth in imports. Furthermore, the ratio of short-term external debt to foreign exchange reserves substantially elevated to 27.96%³⁹ owing to a notable expansion in short-term external debt. These two ratios, nevertheless, were still below internationally recognized warning levels. Consequently, this implies that Taiwan's foreign exchange reserves have a robust capacity to meet payment obligations for imports and to service short-term external debt (Chart 2.15).

External debt contracted after following an upward trajectory and debt-servicing capacity remained strong

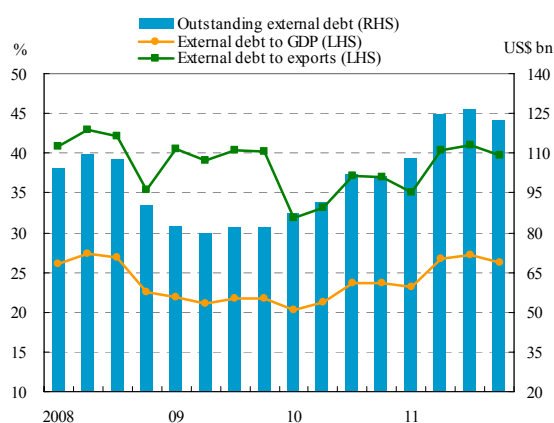
There was a substantial increase in Taiwan's external debt⁴⁰ in the first three quarters of 2011, resulting from domestic banks borrowing funds from overseas and the increase of NT dollar deposits held by non-residents. However, external debt slightly decreased in 2011 Q4 as a result of the reduction in debt owned by foreign institutional investors. Overall, outstanding external debt stood at US\$122.5 billion, or 26.27% of annual GDP, at the end of 2011, implying a moderate level of external debt.⁴¹ Moreover, the ratio of external debt to annual exports was 39.75% as of the end of 2011, indicating that export revenues were still sufficient to cover external debt

Chart 2.15 Short-term external debt servicing capacity



Notes: 1. FX reserves and external debt are end-of-period figures.
2. Imports are average monthly figures.
Sources: CBC, DGBAS and MOF.

Chart 2.16 External debt servicing capacity



Notes: 1. External debts are end-of-period figures.
2. GDP and exports are annual figures.
Sources: CBC, DGBAS and MOF.

³⁸ A country with a ratio of foreign exchange reserves to imports of more than three months is considered to be at relatively low risk.

³⁹ The general international consensus is that a ratio of short-term external debt to foreign exchange reserves less than 50% indicates relatively low risk.

⁴⁰ The CBC defines external debt as the combined amount owed to foreign parties by Taiwan's public and private sectors, including long-term debt with a maturity of greater than one year and short-term debt with a maturity of one year or less. The term "public external debt" refers to debt that the public sector is either obligated to repay directly or has guaranteed (starting from December 2004, figures for public external debt include outstanding foreign debt arising from repo transactions between the CBC and international financial institutions). The term "private external debt" refers to private-sector foreign debt that is not guaranteed by the public sector.

⁴¹ The general international consensus is that a country with a ratio of external debt to GDP lower than 50% is deemed to be at relatively low risk.

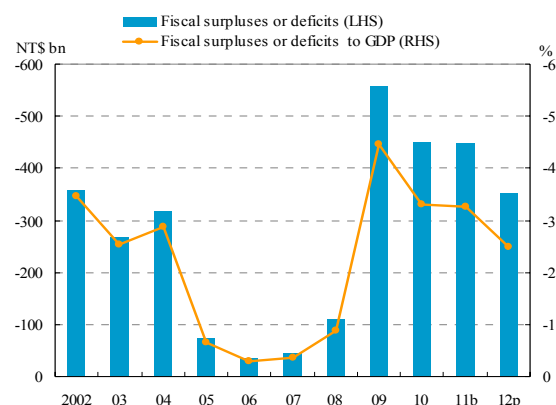
(Chart 2.16), and there were no signs of servicing pressure on external debt.⁴²

Fiscal deficits turned to contract while government debt kept accumulating

Since most of the temporary infrastructure construction expenditures in order to spur the economy harmed by the global financial crisis and Typhoon Marakot had ended, government investment contracted from 2010 onwards, and fiscal deficits at all levels of government continued to decline to NT\$449 billion in 2011. This, combined with the sustained GDP growth of the same year, caused the ratio of fiscal deficit to annual GDP to decline to 3.27% in 2011, and it is expected to further drop to 2.50% in 2012⁴³ (Chart 2.17).

As fiscal deficits stayed high and central and local governments relied on debt issuance to finance debt servicing expenditures, outstanding public debt at all levels of government⁴⁴ expanded to NT\$5.59 trillion, or 40.67% of annual GDP⁴⁵, well above the NT\$5.19 trillion⁴⁶ recorded in 2010. It is expected that public debt will further grow and stay high in 2012 with the ongoing implementation of a bundle of medium-term infrastructure projects (Chart 2.18).

Chart 2.17 Fiscal position

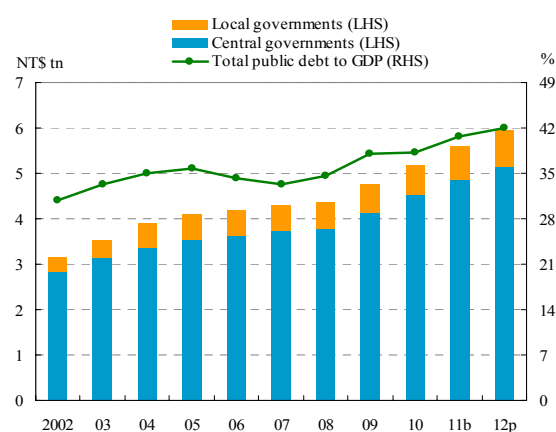


Notes: 1. Fiscal position data include those of central and local governments.

2. Data of fiscal surpluses (deficits) are annual figures. Figures for 2011 and 2012 are budget and proposal accounts, respectively.

Sources: MOF and DGBAS.

Chart 2.18 Public debt



Notes: 1. Outstanding public debt refers to non-self-liquidating debt with a maturity of one year or longer, excluding external debt.

2. Data of fiscal surpluses (deficits) are annual figures. Figures for 2011 and 2012 are budget and proposal accounts, respectively.

Sources: MOF and DGBAS.

⁴² The general international consensus is that a ratio of external debt to exports less than 100% indicates relatively low risk.

⁴³ To provide more context, fiscal deficits in EU member nations are not allowed to exceed 3% of GDP, based on the 1992 European Union Maastricht Treaty and the subsequent Stability and Growth Pact.

⁴⁴ The term “outstanding debt at all levels of government” as used in this report refers to outstanding non-self-liquidating debt with a maturity of one year or longer. The budgeted figures for outstanding one-year-or-longer non-self-liquidating public debt (NT\$5.59 trillion) issued by all levels of government during the 2011 fiscal year is equivalent to 42.06% of the average GNP for the preceding three fiscal years (NT\$13.29 trillion). This figure is below the ceiling of 48% (i.e. 40% for central government and 8% for local governments) set out in the Public Debt Act.

⁴⁵ As a comparison, outstanding debt in EU member nations is not allowed to exceed 60% of GDP, according to the Maastricht Treaty and the subsequent Stability and Growth Pact.

⁴⁶ If adding in debt with a maturity of less than one year and self-liquidating debt, outstanding public debt at the end of 2010 stood at NT\$6.41 trillion.

To promote fiscal health, Taiwan's government unveiled the golden 10-year prospects outline in October 2011. In the outline, the fourth item of the comprehensive blueprint that aims for enhancing a sound fiscal system includes five strategies: diversified sources of government funds, industrialized government finance, just taxation, optimized local finance and minimized public debt. It is expected that healthy finance and fair taxation can be fulfilled through these strategies.

Box 1**The practice of stress testing the banking sector in Taiwan**

The global financial crisis drew increasing attention to the need for developing stress testing models that can identify systemic risk in a financial sector. Against this backdrop, both the Financial Supervisory Commission (FSC) and the CBC devoted efforts to developing adequate stress testing frameworks that could assess adverse impacts on the banking sector and its risk-bearing capability to withstand shocks caused by extreme but plausible macroeconomic conditions.

1. The FSC requires domestic banks to conduct a stress test at least annually under pillar 2 of Basel II

In order to urge domestic banks to place importance on stress testing and enhance their capability of implementation, the FSC required domestic banks to conduct stress tests on bank-specific market risk and credit risk in 2010 and 2011, respectively, according to the requirement of pillar 2 of Basel II. These stress tests were performed to estimate one-year-ahead potential losses and their impact on individual banks' capital adequacy ratios (CARs) under the stressed scenarios, and the test results are required to be submitted to the FSC to serve as a reference for financial supervision. The results released by the FSC showed that: (1) the average CARs of domestic banks were above the regulatory minimum of 8%; and (2) all banks could meet the minimum regulatory standard after recapitalization and asset reallocation.

2. The CBC developed macro stress testing models

In accordance with the operational objective that aims at promoting financial stability, the CBC has recently been developing macro stress testing models with a view to assessing the resilience of the whole banking system against adverse macroeconomic and financial shocks. Initially, the CBC cooperated with domestic academics to develop stress testing models from 2007 onwards. These models, which intend to offer a quantitative analysis of the potential fragilities in the domestic banking sector, are viewed as a cornerstone for the development of the CBC's macro stress testing framework.

In 2010, the CBC established a macro stress testing model of market risks.¹ In terms of sensitivity analysis and scenario simulation, this model was developed to gauge the effects of different market shocks² on individual banks' CARs and Tier-one capital ratios using their market exposure positions during 2007 to 2009, and in turn to assess domestic

banks' risk-bearing capabilities in abnormal market conditions. Specifically, a macroeconomic model was then built to verify whether the parameters of the stressed scenarios could be mapped onto the macroeconomic environment by means of a Vector Autoregression (VAR) analysis. The empirical result suggested that domestic banks' capital levels were generally resilient to withstand the market risk shocks simulated by the stress tests done by the CBC.

In 2011, the CBC further developed a framework which was carried out in a top-down fashion for stress testing the credit risk of the banking sector in Taiwan.³ A macroeconometric model was used to analyze the statistical correlation between the default rates of banks' portfolios and relevant macroeconomic variables (such as Taiwan's real GDP, global real GDP, global exports, interest rates, property prices and unemployment rates). Additionally, a satellite model was applied to link a measurement of the credit risks to the variables that proxy macroeconomic conditions and to map the external macroeconomic shocks onto banks' balance sheets. Accordingly, one-year-ahead potential credit losses for domestic banks' loan portfolios could be estimated so as to scrutinize the effect of shocks on banks' overall profitability and capital adequacy under different macroeconomic stressed scenarios. In the model-based stressed scenarios, the result showed that the banking sector as a whole, given the one-year-ahead predicted values of overall profit and regulatory capital, was well equipped to withstand the impact of adverse macroeconomic conditions on banks' credit risk exposures.

Notes: 1. The CBC's macro testing model of banks' market risk was mainly based on the stress testing template created by Martin Čihák (2007). However, this model also referred to the stress test process in the context of the Financial Sector Assessment Program (FSAP) of the IMF and the methodology of a domestic research project that was outsourced by the CBC for stress testing the financial system in Taiwan.

2. These shocks include the adverse movement of foreign exchange rates, interest rates and equity prices.

3. The CBC's macro stress testing model of banks' credit risk mainly referred to a similar model employed by the Hong Kong Monetary Authority, the methodologies in CBC outsourced papers and other relevant papers. The framework consists of a macroeconomic model and Monte Carlo simulations with stress tests. In the macroeconomic model, the seemingly unrelated regression (SUR) method was applied to estimate the relationship between the default rates of bank loans and different macroeconomic values based on historical data. A variance-covariance matrix was in turn used to capture the joint error terms between macroeconomic variables and the logit-transformed default rates of bank loans. Multivariate regression analysis was then carried out to determine the macroeconomic variables which exhibited considerable explanatory power or a strong correlation with the sector-specific default rate. Under the Monte Carlo simulation, 10,000 future paths of one-year-ahead values of probabilities of default (PDs) were simulated

based on the SUR estimates, and in turn the simulated 10,000 PDs could be applied to construct a frequency distribution of credit losses for each of the baseline and stressed scenarios.

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