Models for Banks' Loan Impairment Charges in Stress Tests of the Financial System – Summary

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INTRODUCTION AND SUMMARY

In an international perspective, the financial crisis has led to renewed focus on development of models for assessing financial stability. A case in point is macro stress testing of banks' capitalisation.

A key element of macro stress testing is to calculate banks' loan impairment charges in macroeconomic scenarios with severe negative shocks to the economy. Loan impairment charges are often the decisive factor determining the banks' financial performance and excess capital adequacy in periods of unfavourable macroeconomic developments. This is because credit is at the core of banking activities, so naturally it is also the major source of potential losses.

In Part 2 of this Monetary Review, an empirical study has been carried out of the link between business cycles and the banks' loan impairment charges, cf. Abildgren and Damgaard (2012). Furthermore, two specific econometric models for banks' loan impairment charges are constructed and compared; these models may be used for stress testing purposes. Finally, the limitations on the use of such models for macro stress testing are discussed. This overview provides a non-technical summary of the main findings and conclusions of the article.

The current accounting principles entail considerable cyclical variation in the banks' loan impairment charge ratios. Loan impairment charges are relatively high in years when the economy is slowing down and bank earnings are under pressure, while they are relatively low in years with high economic growth and sound bank earnings. This link between the banks' loan impairment charges and the business cycle should be reflected in the models used for calculating loan impairment charges in stress tests.

All else equal, loan impairment charges under the current accounting principles increase the banks' lending capacity during booms and reduce their lending capacity during recessions. Hence the accounting rules for

loan impairment charges are procyclical, i.e. they amplify cyclical fluctuations. In the wake of the most recent financial crisis it has been discussed whether there is a need to amend the accounting rules so as to ensure that banks build up buffers against losses in bad times in good times.

Both of the estimated models provide a good description of the historical development in loan impairment charges and are able to explain the high loan impairment charge ratios during the crisis from 2008 onwards.

By definition, all models are simplified presentations of reality. So when constructing model-based projections it is customary to include extra information besides that contained in the model's estimated relations. During the most recent financial crisis, for example, the Danish government has implemented extensive measures to support financial stability. Without these initiatives, the economic crisis would undoubtedly have been worse, and the banks' loan impairment charges would have been larger than they actually were. This should be borne in mind if the models are to be used for simulating loan impairment charges in stress scenarios without such massive government support.

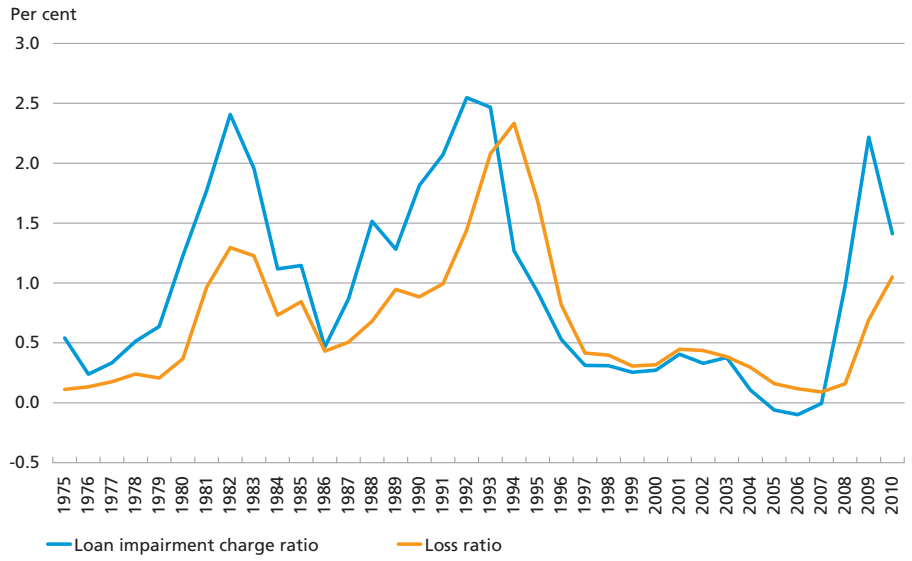
THE BANKS' LOAN IMPAIRMENT CHARGES

There is considerable cyclical variation in the banks' loan impairment charge ratios, cf. Chart 1. Under the present accounting rules from 2005, exposures are not to be charged to impairment expenses until there is objective evidence of impairment. In good times with low unemployment and sound corporate earnings, the number of non-performing loans etc. is relatively small, resulting in low loan impairment charge ratios. Conversely, the number of non-performing loans is relatively high in a recession, entailing high loan impairment charge ratios.

There was also considerable cyclical variation in the banks' loan impairment charges before 2005. Loan impairment charges made in the years up to the early 1990s helped to ensure that the banks had buffers which they could use to meet losses during the economic crisis in the first half of the 1990s. This was one of the reasons why Denmark weathered the crisis much better than the other Nordic countries. In Finland, profit and loss accounts were, until 1990, based on expensing actual losses only. In Norway and Sweden, provisions had to be made for expected losses, but in Sweden the requirements in this respect had been eased when the banking crisis began, and in Norway the requirements had by no means been observed in practice, cf. Abildgren et al. (2010).

DANISH BANKS' LOSSES AND IMPAIRMENT CHARGES ON LOANS AND GUARANTEES

Chart 1



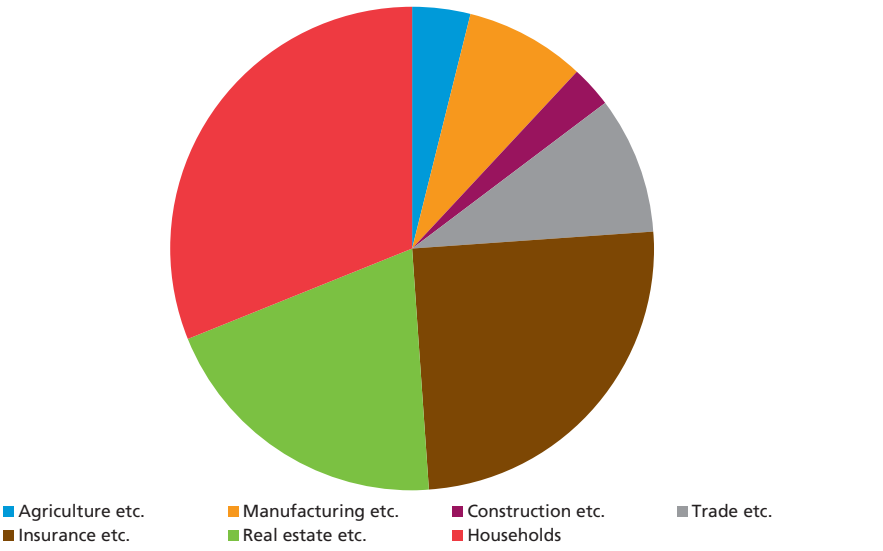
Note: Loan impairment charges have been stated net of reversal of previous loan impairment charges as income. There is a data break in the series for loan impairment charges in 2005, when the accounting standards were amended.
Source: Danish Financial Supervisory Authority, Baldvinsson et al. (2005) and Busch-Nielsen et al. (1996).

Since the mid-1980s, there has been a tendency to make loan impairment charges 1-2 years before realisation of the losses. So far this does not seem to have changed since the transition to the new accounting rules in 2005.

Very little detailed statistical information is available about the banks' loan impairment charges. Based on the statistics of the banks' losses and accumulated loan impairment charges published by the Danish Financial Supervisory Authority, Abildgren and Damgaard (2012) approximate the banks' loan impairment charges by industry and sector since 1992.

Chart 2 shows the banks' exposures broken down by industry at end-2010, while the calculated loan impairment charge ratios since 1992 are shown in Chart 3. It should be noted that these loan impairment charge ratios concern the banks' total credit exposures to the industry or sector in question – whether or not the customer is a Danish resident. According to Danmarks Nationalbank's MFI statistics, non-residents – mainly residents of Sweden, Norway, Ireland, the UK, the Baltic States and the USA – are counterparties to around 40 per cent of lending to non-MFIs by Danish banks and their foreign branches. However, the existing statistics do not provide a basis for breaking down loan impairment charge ratios by customer geographics.

DANISH BANKS' LOANS AND GUARANTEES BY INDUSTRY AND SECTOR, END-2010 Chart 2



Note: Agriculture etc. includes agriculture, hunting, forestry and fisheries. Manufacturing etc. includes manufacturing, extraction of raw materials and energy supplies. Construction etc. includes building and construction. Trade etc. includes trade, transport, hotels and restaurants and information and communication. Insurance etc. includes financing (excl. credit institutions) and insurance. Real estate etc. includes real estate, other private business sectors and the public sector. Households include wage earners and pensioners etc., but not the self-employed. Lending to private individuals against real property as collateral is included in households, not in real estate etc.
Source: Danish Financial Supervisory Authority.

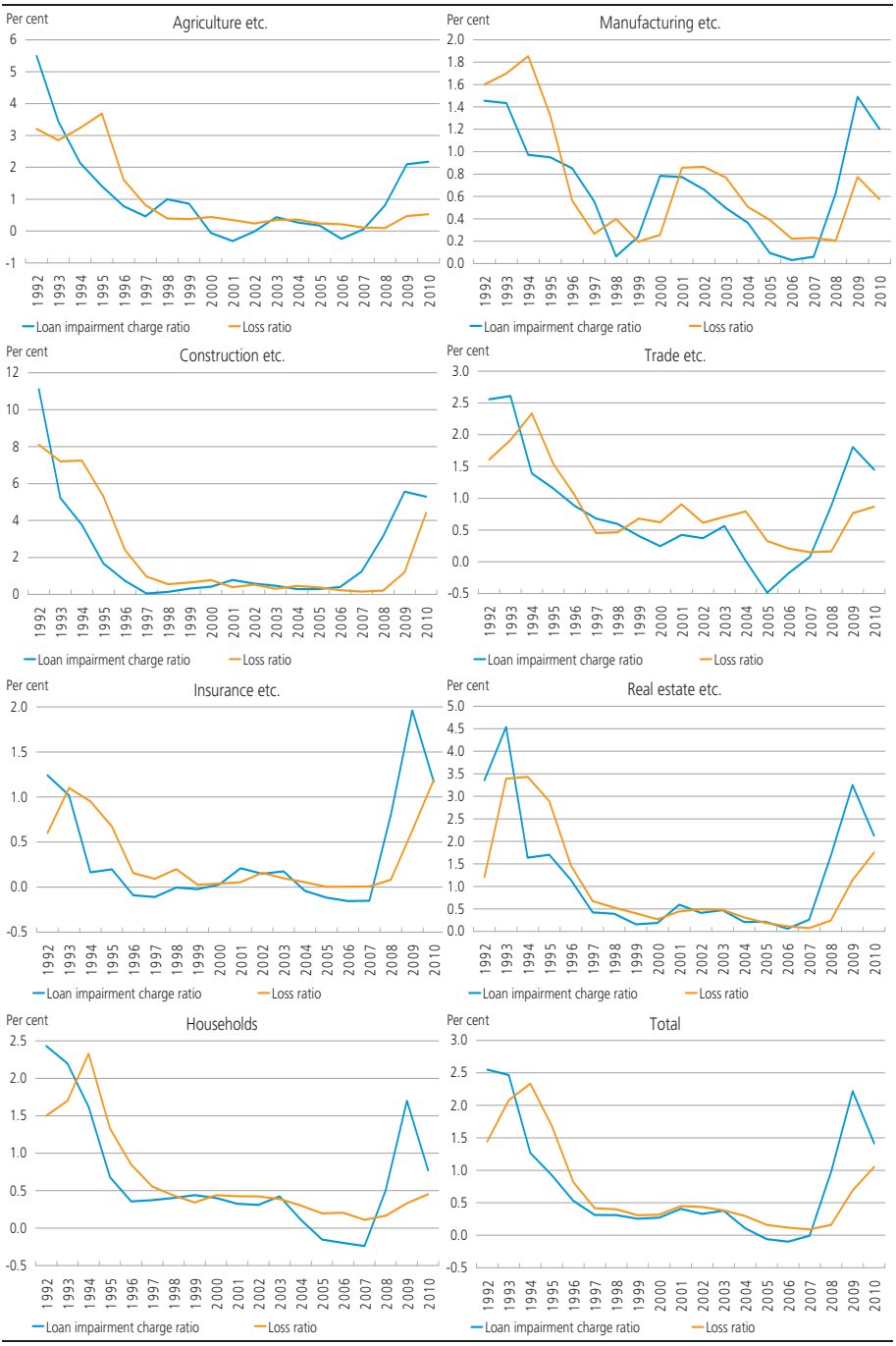
Although the approximated loan impairment charge ratios are subject to some uncertainty, several clear trends nevertheless emerge. For all industries and sectors, there is a tendency to make loan impairment charges 1-2 years before realisation of the losses. It is also seen that loan impairment charge ratios were relatively high in connection with the economic crisis in the early 1990s and the financial crisis from 2008 onwards, especially for agriculture etc., construction etc. and real estate etc.

The cyclical variation in the banks' loan impairment charge ratios is reflected in their interest margins. Interest margins tend to be relatively narrow during upswings and relatively wide during downturns, cf. Abildgren (2012). The banks' expected losses and hence their loan impairment charges can be seen as the costs of providing loans and guarantees etc., in line with staff and IT costs etc., and the banks need to cover these costs by charging an appropriate premium, which is added to the financing and administrative costs etc., cf. Andersen et al. (2001).

All else equal, the current accounting principles for loan impairment charges contribute to increasing the banks' lending capacity during

DANISH BANKS' LOSSES AND IMPAIRMENT CHARGES ON LOANS AND GUARANTEES BY INDUSTRY AND SECTOR

Chart 3



Note: The aggregate loan impairment charges have not been calculated, but are based directly on the Danish Financial Supervisory Authority's accounts statistics.

Source: Abildgren and Damgaard (2012).

booms and reducing it during recessions. Hence the current loan impairment charge rules are procyclical, i.e. they amplify cyclical fluctuations. In the wake of the most recent financial crisis, it has therefore been discussed whether there is a need to amend the rules with a view to reducing procyclicality in the banking sector, cf. Babic (2009) and Babic and Rasmussen (2010). One element of the debate has been the "Spanish model" for making provisions. This model entails that Spanish credit institutions must make loan impairment charges not only according to the principle of objective evidence of impairment ("specific provisions"), but also on the basis of average historical loss ratios over a business cycle ("dynamic provisions"). In periods with low specific provisions, the dynamic provisions are increased, while they are reduced in period with high specific provisions. This means that a bank's total loan impairment charges in a given period become less cyclical, and in good times the bank builds up a buffer against losses in bad times.

In July 2009, the European Commission published its deliberations concerning implementation of dynamic provisions in accordance with the Spanish model as a supplement to loan impairment charges under the existing international accounting standards. In the European Commission's consultation paper from February 2010, the thoughts about dynamic provisions had made way for contemplations about "countercyclical provisions" also aimed at ensuring that the banks, via loan impairment charges, build up buffers against their expected losses over a business cycle. The Commission has not followed up these proposals subsequently. So far, the regulatory response to the financial crisis in relation to the issue of procyclicality in the banking sector has mainly focused on introducing countercyclical capital buffers, cf. Harmsen (2010) and Babic (2011).

Currently, the international accounting standards boards, IASB[1] and FASB[2], are working on proposals for new accounting standards to ensure that loan impairment charges are made at an earlier point than under the current principles. However, the proposals from the IASB and the FASB do not envisage smoothing of loan impairment charges over the business cycle.

[1] The International Accounting Standards Board, an independent organisation working to make financial statements comparable across countries.

[2] The Financial Accounting Standards Board, which develops accounting standards that are generally accepted in the USA.

TWO ECONOMETRIC MODELS FOR DANISH BANKS' LOAN IMPAIRMENT CHARGES

There are several approaches to modelling banks' loan impairment charges in connection with macro stress testing of the financial system. These approaches differ in terms of degree of detail as well as methodology. Abildgren and Damgaard (2012) construct and compare two specific econometric models for banks' loan impairment charges.

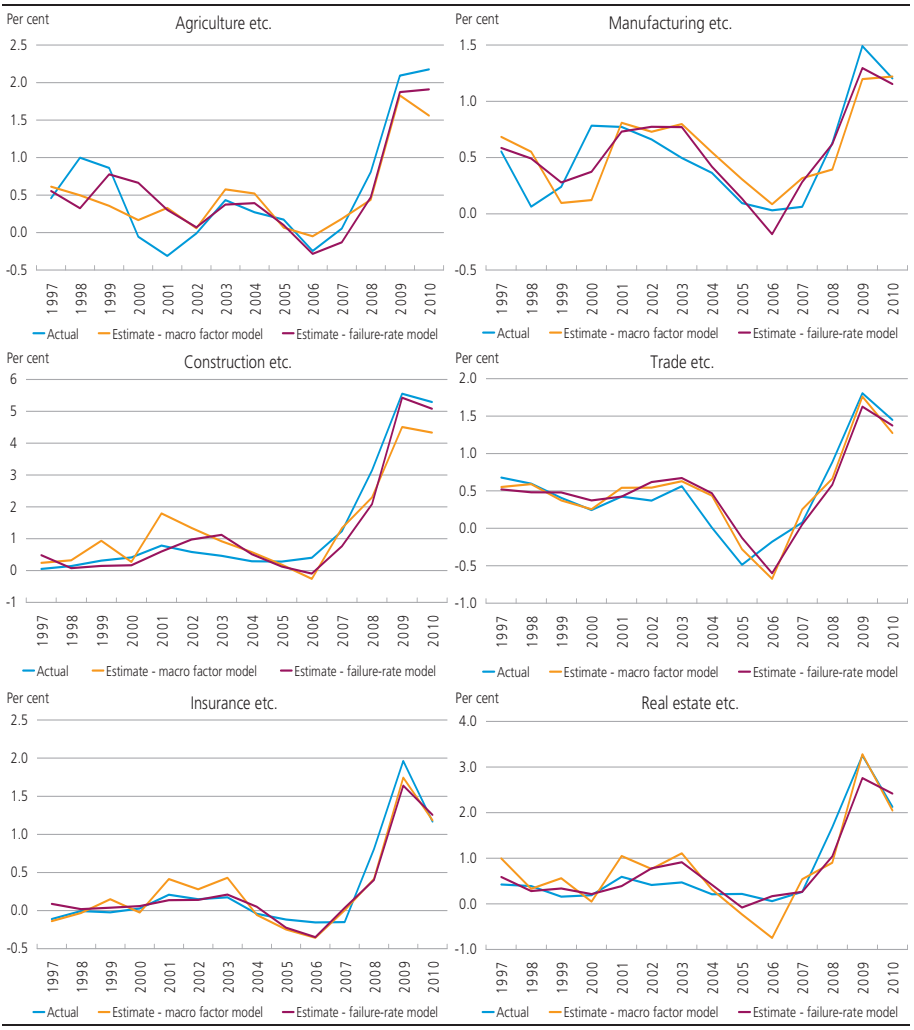
The first model is a macro factor model in which the impairment charge ratio for Danish banks' loans and guarantees is modelled as a function of a number of macroeconomic variables from the period 1992-2010. As regards the impairment charge ratio for loans and guarantees to households, the explanatory variables are the unemployment rate and real growth in house prices. As regards the impairment charge ratios on loans and guarantees to the six industries, the explanatory variables are real growth in demand for the industry's output, real interest rates and real growth in house prices. The latter can be seen as an indicator of real growth in the prices of commercial properties. With the estimated macro factor model, it is possible to calculate the industry/sector distribution of loan impairment charge ratios over the projection period for each of the scenarios included in a stress test. Combining this information with the individual bank's credit exposures by industry and sector over the projection period makes it possible to calculate the individual bank's loan impairment charges for each scenario. This allows the distribution of credit exposures to households and the various industries to be taken into account.

The second model is an accounts-based failure-rate model for Danish banks' loan impairment charge ratios for corporate credit exposures. The model is estimated on the basis of the financial statements from an average of around 96,000 firms in the period 1995-2009. Essentially, stress testing using this model type means constructing a number of macroeconomic scenarios for future economic developments. On the basis of developments in the real gross domestic product, building and construction investment and real interest rates, developments in the key financial ratios of each firm are projected in the various scenarios, after which the individual firm's probability of default and the banks' loan impairment charges can be calculated.

Chart 4 compares the actual loan impairment charge ratios with the estimated loan impairment charge ratios from the macro factor model and the accounts-based failure-rate model, respectively, as regards corporate lending. Both models provide a fairly good description of the historical development in loan impairment charges and are able to ex-

ACTUAL AND ESTIMATED IMPAIRMENT CHARGE RATIOS ON LOANS AND GUARANTEES FROM DANISH BANKS

Chart 4



Source: Abildgren and Damgaard (2012).

plain the high loan impairment charge ratios during the crisis from 2008 onwards. This is an important feature of models that are to be used for macro stress testing.

LIMITATIONS ON THE USE OF ECONOMETRIC MODELS FOR STRESS TESTING

By definition, all econometric models are simplified representations of reality. So when constructing model-based projections it is customary to include extra information besides that contained in the model's estimated relations. This information is implemented using "adjustment terms".

A model can be seen as an instrument for making projections in dialogue with its user. This also applies to models for banks' loan impairment charges. Models help the user to ensure consistency in the analyses performed and may provide inspiration for disseminating the "stories" contained in the scenarios.

It is also customary to work with a range of models based on different approaches. Applying different types of models for the banks' loan impairment charges provides a more robust picture of the risks associated with the various stress scenarios. Different models may have different strengths and provide different opportunities for illustrating the respective scenarios in terms of coverage, degree of detail, etc. For example, the failure-rate model provides a basis for gaining a very detailed overview of developments in probabilities of default over the projection period, broken down by, say, sub-sectors and corporate debt levels. This makes it easier to incorporate additional information for stress testing purposes.

It is necessary to add a few specific comments as regards application of the two estimated loan impairment charge models in connection with stress testing of the financial system.

The period 1992-2010 – which has been used for estimating the macro factor model – was characterised by a clear downward trend in both unemployment and short-term and long-term real interest rates. It is therefore uncertain whether the parameter estimates of the models can be assumed to apply to periods of sharp increases in unemployment and interest rates over a short-term horizon. Similar issues apply in relation to the accounts-based failure-rate model, which has been estimated on the basis of an even shorter data period than the macro factor model.

Moreover, the models do not take into account any differences in the credit quality of the individual banks' loans and guarantees for a given industry. This may also entail a need for adjustment terms for some banks.

One way to take into account differences in credit quality could be to take the bank-specific data for total loan impairment charges and loans and guarantees broken down by industry/sector reported to the Danish Financial Supervisory Authority as the point of departure. On the basis of the banking sector's aggregate loan impairment charge ratios by industry and sector, cf. Chart 3, and the bank-specific exposures, it is possible to calculate the total loan impairment charges that each bank would have made if its loan impairment charge ratio had matched that of the sector overall. If a given bank has systematically had higher actual loan impairment charge ratios than those that can be calculated on the basis of the banking sector's aggregate loan impairment charge ratios

by industry and sector, this could indicate that the loans granted by the bank in question involve a relatively high credit risk. In addition, it could be investigated whether lending and funding rates can be applied as indicators for the credit quality of a bank's loan portfolio. An advantage of interest-rate indicators is that they are more forward-oriented than historical loan impairment charges.

As regards the failure-rate model, the database provides information about the firm's main bank for around half of the firms. If the firms that have stated their main bank can be assumed to be representative of the loan portfolios of the individual banks, this will provide a basis for including bank-specific differences in terms of the credit quality of loans and guarantees in the loan impairment charges calculated using the failure-rate model.

During the most recent financial crisis, the Danish government has implemented extensive support measures, e.g. Bank Rescue Package 1 (general government guarantee for the banks' depositors and unsecured creditors) in October 2008, and Bank Rescue Package 2 (government capital injections into banks and the option to purchase individual government guarantees for non-subordinated unsecured debt) in February 2009. Without these initiatives, the economic crisis would undoubtedly have been worse, and the banks' loan impairment charges would have been larger than they actually were. This should be borne in mind if the models are to be used for simulating loan impairment charges in stress scenarios without such massive government support.

Furthermore, it should be noted that any feedback effects from a stressed banking sector to the macroeconomy must, to some extent, be treated separately outside the models. Actual historical loan impairment charge ratios used for estimating the models reflect the historical feedback effects seen in connection with banking crises. If the stress scenarios analysed involve macroeconomic developments that are worse than those seen during the banking crises occurring in the estimation period, it may be necessary to incorporate further feedback effects outside the models.

It is also possible that the effects of banking crises on loan impairment charges depend on the frequency of such banking crises. For example, if one banking crisis follows immediately after another, the impact on loan impairment charges may be greater than if the banking crises are 15-20 years apart. The reason is that households and firms have little time to consolidate if one financial crisis is succeeded by another.

Finally, it should be mentioned that although there are many similarities between financial crises, they also differ. To the extent that a stress scenario includes new risk factors not reflected in historical events,

it may be necessary to adjust the results calculated using loan impairment charge models estimated on the basis of historical data.

CONCLUDING REMARKS

The period since the mid-1990s has been characterised by increased focus on financial stability among central banks worldwide. In 1996, the Bank of England began to publish regular Financial Stability Reviews focusing on financial institutions, financial markets and payment systems. Sveriges Riksbank and Norges Bank followed suit in 1997, and today around 80 central banks worldwide publish such reports, cf. Cihák et al. (2012). Danmarks Nationalbank began to publish financial stability reports in 2000.[1]

A key element of many financial stability reports has been macro stress tests of the financial system. In 2009, the European Banking Authority, working in collaboration with the European Central Bank and the national supervisory authorities, also began to perform regular macro stress tests of the banking system. So it is likely that focus in the coming years will still be on refining the approaches and methods used to model banks' loan impairment charges in connection with macroeconomic stress tests with a view to improving the basis for assessment of financial stability.

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