

**DUAL INDEX MORTGAGES
(DIMs): CONDITIONS OF
SUSTAINABLE
DEVELOPMENT IN POLAND**

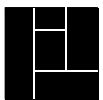
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EXECUTIVE SUMMARY

Dual Index Mortgages (DIMs): Conditions of Sustainable Development in Poland is one in a series of three papers developed for the National Bank of Poland by the Poland Housing Finance Project, funded by USAID, in an effort to assist the evolution of the housing finance system in Poland. The National Bank of Poland (NBP) is in the process of revising the supervision and regulation of mortgage financing in Poland, and this paper responds to NBP's need for a better understanding of DIMs and their inherent risks, as well as providing suggestions regarding the potential prudential regulatory and supervisory parameters appropriate to these products.

Related papers include *The Risks of Commercial Real Estate Lending*, prepared by Michael Lea of Cardiff Consulting Services, Inc., with contributions by Achim Dübel (empirica), Jacek Łaszek (Cracow Real Estate Institute), Loïc Chiquier, and William Handorf; and *Regulation and Supervision of Mortgage Finance*, prepared by William Handorf for Abt Associates Inc. The papers were presented at a seminar sponsored by NBP in Warsaw on September 4, 1997.

In inflationary economic conditions, DIMs can be an effective housing finance instrument. The unique ability of DIMs to self-adjust provides opportunities for both borrowers and lenders, combining credit affordability and, ultimately, profitability for the lender. DIMs amortize according to two independent indexes—an index reflecting the changing income of borrowers and a financial index—as the flow of payments and amortization rates are separated from credit rates. Despite their efficacy, DIMs are complex products to underwrite, and if improperly underwritten, they can lead to severe contingent liabilities.

Several characteristics of DIM credits make the DIM system a practical option for Poland: DIMs are relatively inflation-proof, more affordable than conventional credits, and resistant to external shocks.

Appropriate DIM parameters and indexation can also help minimize risk. The design of DIMs requires choosing appropriate indexes that closely reflect the evolution of borrowers' incomes and the costs of lenders' funds; the indexes must be adjusted as often as necessary, be regularly published, and be relatively free from distortions. This paper suggests index options for DIM scenarios for Poland and provides examples of DIMs in other countries. Establishing an efficient DIM system requires frequent monitoring of payment-to-balance ratios and consideration of credit policies that have been recently developed. *Dual Index Mortgages* details several other recommendations for the sound underwriting and supervision of a DIM system and uses the experiences of Mexico, France, and other countries to help create a viable scenario for Poland's housing finance system.

DUAL INDEX MORTGAGES (DIMS): CONDITIONS OF SUSTAINABLE DEVELOPMENT IN POLAND

INTRODUCTION

Context and Objectives of the Report

The Polish housing finance system is facing decisive changes, as a growing number of competing primary lenders have entered the long-term mortgage business in a short space of time. Most of them include in their pattern of products a number of DIM variants. Poland is one of the few countries in the world with a mortgage market actively using DIMs; others include Turkey, Mexico, Ghana, Russia, and France. International experience has demonstrated the remarkable stabilizing characteristics of DIMs as profitable and affordable instruments in difficult and unstable economic conditions; in addition, however, their complexity and potentially adverse consequences are evident when they are improperly understood, designed, underwritten, or supervised.

In light of Poland's improving economy, the NBP expressed the desire to understand better at an early stage in the development of the housing finance sector the major risks inherent in DIMs, and to prepare the potential prudential regulatory and supervisory parameters appropriate to these products.

This report seeks to answer the following questions:

- How does a DIM function as a mortgage credit?
- What are its various associated inherent risks?
- How should a DIM be prudentially designed?
- What would be a satisfactory underwriting and monitoring policy?
- What regulatory and supervisory recommendations are appropriate for Poland at this time?

Definitions and Basics About Mortgage Credits and DIMs

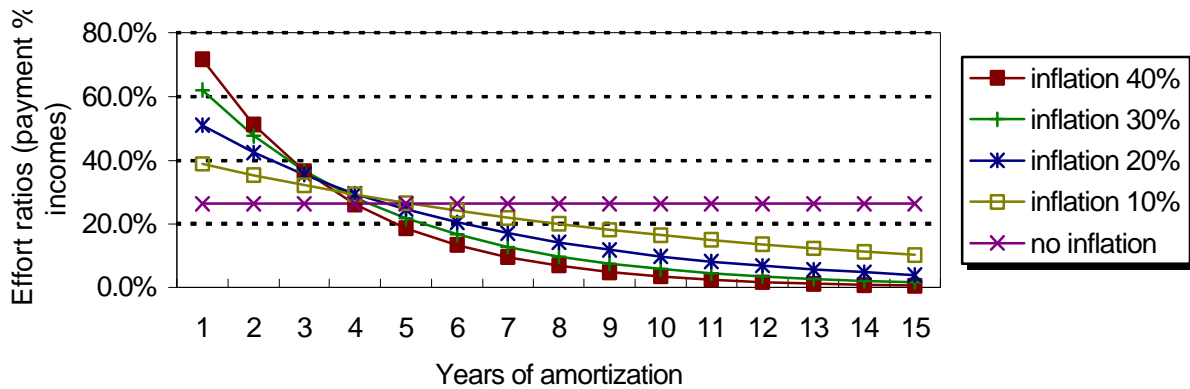
In unstable economic conditions, DIMs act as self-adjustable long-term mortgage credits, providing the following benefits:

- Borrowers can achieve relative credit affordability (despite high rates mostly caused by inflation), and stable or declining effort ratios (debt service-to-income ratios), even when incomes may fluctuate; and
- Lenders can achieve variable market-oriented rates to secure their net profitability (their matching funding must be priced through outstanding credit balances).



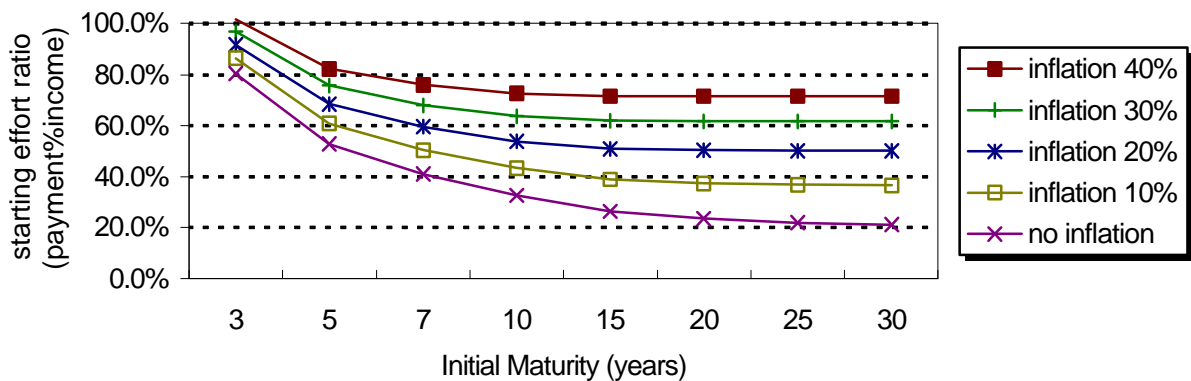
Classical Instruments. Classical mortgage products are not able to reconcile these two constraints simultaneously in unstable economies. “Classical” credits (whether fixed or variable rate) do not defer the payment of market-based interest due. In inflationary economies, the initial effort ratios are thus made unaffordable (see *Graph 1-A*).

Graph 1-A
Tilt effect of classical credits



The required stability of nominal payments implies a disequilibrium of real deflated payments between excessive initial payments and later insignificant ones. Loan amounts must then be reduced (divided by a factor of two in Poland when compared with a no-inflation case). Extended terms do not help much in such cases (see *Graph 1-B*). On the other hand, effort ratios then rapidly decline, as do the deflated balance and credit risks. Classical credits make more sense for short- and medium-term credits of relatively modest

Graph 1-B
Impacts of maturity on starting effort





amounts (complementary financing, small investments like renovation). Thus, they still represent a solid product for lenders entering the mortgage business, particularly under improving Polish macro-economic conditions (declining inflation, but still largely fluctuating real rates and incomes).

In unstable economies, fixed-rate, long-term credits create large interest rate risks for lenders and an affordability problem for borrowers. They convey some gambling anticipation of inflation, reflected in large rate premiums, which make credits more expensive; larger prepayment risks;¹ and very serious interest rate risks for lenders because available resources are shorter-term (no market hedging tools yet exist in Poland). The fact that borrowers must pay for interest due implies very large, perhaps unaffordable initial repayments, whereas later deflated payments may fall exponentially on the other hand. Their simplicity is thus somewhat illusory, as this product can be costly for both lenders and borrowers.

Long-term fixed rates would become possible if prepayments could be limited (through high fees?), and if fixed-rate liabilities could properly match DIM balances. Such may not be the case yet in Poland. Even a mortgage bank may find it hard to pass this interest rate risk on to investors.

Variable rates are still preferable, as they correspond to safer (more accessible, liquid, and diversified) resources. The whole system is improved because more lenders can compete to offer a wider range of products, whereas only a few solid financial institutions could assume and price fixed-rate risks. Indexed adjustable rate mortgages could still be replaced gradually by “rolled-over” adjustable rate mortgages, instituting a longer period before adjusting the credit rate (which is fixed in the interim).

DIMs. By contrast, DIMs are amortized according to the evolution of two independent indexes, as the flows of payments and amortization rates are separated from credit rates. Payments are adjusted according to an index reflecting the changing incomes of borrowers: for example, the Wage Index in Poland (national quarterly for the Mortgage Fund, regional for PKO BP’s normative credits); the Minimum Wage Index in Mexico (revised once or twice a year by authorities according to economic and political factors); the Consumer Price Index (in Mexico since 1996); the Index of Construction Cost in France (adjusting rental incomes, closely tied to inflation); or other income or cost-of-living indexes, etc. This indexation should ensure more stable effort ratios for borrowers, as with classical credits in a no-inflation world.

¹ If short-term market rates later decline, which is very likely in Poland, the likelihood of prepayment increases.

Credit rates are usually adjusted to a financial index, which should reflect as closely as possible the cost of the funds that finance these long-term credits: for example, the Interbanking Rate (Wibor); the Average Banking Cost of Funds in Mexico (CPP); Treasury Interbanking Rate (Wibor); the Average Banking Cost of Funds in Mexico (CPP); Treasury Bills (financial reference in Mexico through CETE, 13-week Treasury Bills for the Polish Mortgage Fund²); monthly-adjusted 1-year deposit rates of the largest Polish banks for PKO BP's normative credits, etc. A margin is then added to (or multiplied by) the base rate, in order to price the corresponding costs, risks, and profitability of the lending bank.

The first payment of a DIM is set according to the loan amount, the projected maturity, and the expected divergence between the deflated values of the two variable indexes. Subsequent payments are indexed until the credit is amortized. The process is automatic and self-adjustable.³ Payment rates are thereby disconnected from amortization rates. There are many ways to define the crucial first payment of a DIM credit. It is usually expressed either as a percentage of the credit amount or, more rarely, through an indirect resulting payment rate, which differs from the applied credit interest rate.

The final maturity is shortened if the difference between the financial index and the income index is smaller than expected, and extended if it is larger. The maturity therefore provides the crucial flexibility to build lender profitability and borrower affordability simultaneously in changing and unpredictable economic environments in the long run. This report presents an analytical model that regulates the relations among these various factors.

Thanks to the indexation process, initial payments remain affordable. Under inflationary conditions, initial payments are lower than interest due, thus generating a

² Monthly average of nominal yields from the latest four weekly tenders. This rate is treated as effective for the Fund's refinancing cost (the difference between nominal and effective rates being a public subsidy). The Fund then adds its own nominal margin (2.1 percent as maximum for its operations), before publishing its base rate. This margin is discounted according to planned and actual withdrawals of participating banks.

³ If P_0 represents the first payment and W_j the growth of income index between the period $j-1$ and j , indexed payments P_j are determined as follows:

$$P_j = P_0 * (1+W_1) * (1+W_2) * \dots * (1+W_j).$$

With L_0 as the initial loan, i_j interest rates between the period $j-1$ and j , the maturity N and the initial payment-to-loan ratio is determined as follows:

$$1 / (P_0/L_0) = \frac{(1+W_1)}{(1+i_1)} + \frac{(1+W_1)*(1+W_2)}{(1+i_1)^* (1+i_2)} + \dots + \frac{(1+W_1)*(1+W_2)*\dots*(1+W_N)}{(1+i_1)^* (1+i_2)^* \dots (1+i_N)}$$

period of capitalization of interest (“negative amortization” through rising nominal debt balances), from which the amount and duration will depend primarily on the rate of inflation. Meanwhile, the deflated balance should continue to decline steadily. Indexed payments would then exceed interest in order to eventually amortize the nominal balance.

The ratio of loan balance to housing value (the decisive element of an adequate guarantee for the lender, which reciprocally measures the built-up equity of the borrower) should also decline, as the capitalization of interest falls below inflation. However, there is still a residual risk of rising ratios during early years if (1) the capitalization was maximal due to a large difference between the rate index and the income index; and (2) home value appreciation rates fall significantly below the rate of inflation.⁴

Banks may thus set more conservative maximum loan-to-value ceilings for all credits like DIMs, which defer interest. (Banks may also be conservative because of the complexity and length of foreclosure procedures in Poland.)

Illustrative Example of a DIM Credit in Poland (A DIM Eligible for the Mortgage Fund)

Simulated DIM Credit Under Current Underwriting Conditions. The characteristics of these are as follows:

- A loan amount equivalent to 25 months of household income (80,000 PLN of credit amount for every 3,200 PLN of the borrowing family’s gross monthly income, based on two working members).
- First monthly payment equals one percent of the loan (with a stable 25 percent ratio).
- Starting nominal interest rate: 25 percent in June 1997 (margin four percent, Treasury Bills 21 percent; Fund’s rate 21.2 percent).
- Starting inflation rate of 15 percent, then slowly declining by a relative 10 percent yearly factor (a conservative assumption).
- Monthly payments, readjusted quarterly by the National Wage Index.

⁴ In Poland, the housing shortage situation and growing housing demand (housing being perceived as a protective hedge) should at least stabilize prices in urban centers. A crisis is unlikely. But credit defaults may precipitate a fall in prices (in the UK many non-performing mortgage credits resulted in forced sales).

- The expected average yearly divergence between applied base indexes (Fund's published rate, driven by 13-week Treasury Bills before lender's margin, and the National Wage Index) is simulated at three percent. Note: Despite seasonal fluctuations, the average divergence has stood at close to 0 percent since 1994; however, it went up to 13 percent during the "shock therapy" of 1990-1992.

Results are obtained from a model developed specifically for credits refinanced by the Mortgage Fund.

Figures can also be obtained from "Pioneer," a user-friendly simulating software developed by the Fund (with EBRD's assistance) for primary banks' loan officers and their potential clients.

Table 1

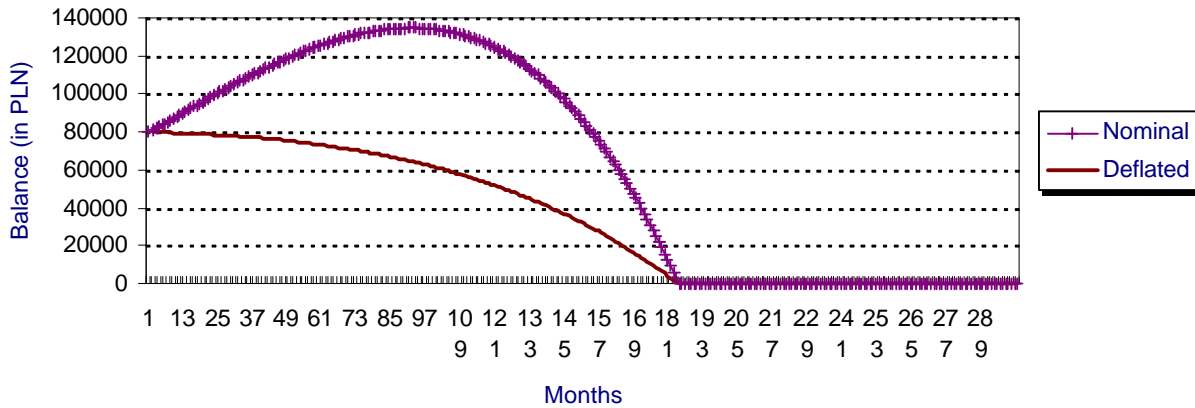
Average divergence rate	3 percent	0 percent
Amortization period	15.4 years	11.8 years
Cumulated negative amortization	75 percent of the loan	50 percent of the loan
Period of negative amortization	8 years	7 years
Deflated balance	steadily declining until the final amortization	

Larger inflation rates would directly raise the level of negative amortization. However, they would theoretically affect neither the real amortization nor the final maturity. In practice, there is a mild influence (the more inflation, the longer maturity) because the Fund's DIMs are not "purely" indexed.⁵

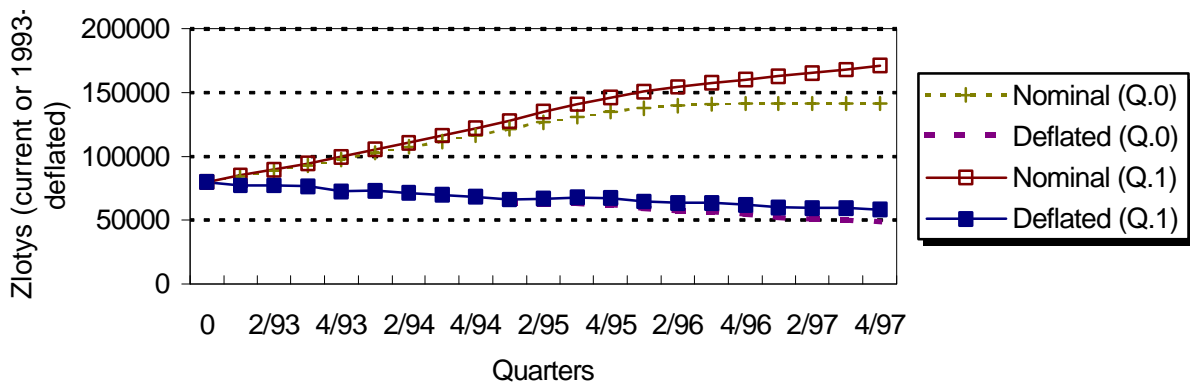
Historical DIM Originated in 1993. *Graph 3* depicts the "ex-post" evolution of a similar historical DIM, which would have been originated at the creation of the Mortgage Fund in 1993. Two subsidiary scenarios are simulated: one in which payments during the first quarter are changed by an index applied at the beginning of the quarter; and the other in which the first indexation would take place at the beginning of the second quarter.

⁵ The National Income Index is applied through DIM payments with a 6-month delay, whereas interest rates are readjusted only one month after changing Treasury Bills. The higher inflation, the larger the actual divergence between DIM indexes and the longer maturity. For example, if inflation is assumed constant at 15 percent, the resulting maturities would be respectively 16.4 years and 12.3 years (+ 1 and +0.5 Years). On the other hand, if DIMs could simultaneously adjust both indexes (orthodox model) the final maturity of these credits would respectively be 12.5 years and 10.2 years in this example, and would be perfectly inflation-proof.

Graph 2
Nominal and Real DIM Balances



Graph 3
Nominal & real balances of 1993-vintage



Resulting flows of DIM credits would differ significantly according to this hypothesis, because the applied index was high during the first quarter of 1993 (established from wages recorded during the third quarter of 1992). The evolution of balances is thus

significantly affected. In both cases, DIM balances have been steadily amortizing in deflated terms: between 30 percent and 40 percent of the real capital is already paid back in just over four years. The period of negative amortization is complete for the former, and should take place in two years for the latter. In both cases, the total maturity will not be very long (slightly less than 10 and 13 years respectively), because of a favorable pattern of divergence between DIM indexes during the last four years in Poland (the Wage Index was nearly equal to the Mortgage Fund's base rate).⁶ This trend may not last (due to a likely slowing of wages and higher real interest rates resulting from tighter monetary and budgetary policy).

Main Characteristics of DIM Credits

The main characteristics of DIMs may be summarized as follows:

Inflation-proof and affordable credits. Credit rates do not affect the affordability of DIMs, since indexed payments eventually pay for inflation (assuming that in the long run, incomes roughly keep pace with inflation). DIMs function as if there were no inflation, and they self-adjust to the variations in purchasing power and real rates. Optimal designs could support lending amounts of up to 25 to 27 times average monthly income in Poland.

As long as inflation is not reduced on a sustainable basis, DIMs retain their main usefulness during a transition phase before being gradually replaced by more conventional credit designs. This point is important, as the Polish banking system may soon record a massive growth in mortgage credit portfolios. This characteristic is not unique to DIMs, as other products could become quite affordable (Deferred Payment Mortgage, hard-currency denominated credit, single-bullet capital credit, etc.). However, DIMs represent one of the most "natural" tools of this mortgage development for Poland's near future.

DIMs are relatively resistant to external shocks, if safely designed and underwritten. DIM payments are indexed to stabilize effort ratios, whatever economic trends may occur, provided that the individual borrower's income keeps pace with the average Income Index. When shocks occur (higher interest rates and/or declining incomes), the amortization is automatically and smoothly adjusted. Many, though not all, adverse shocks could thus be absorbed. This "shock resistance" is all the more efficient if DIMs are safely underwritten and monitored (in contrast to the experience of the recent

⁶ Purchasing power superior to the cost of money, with booming trends of wages (both reflected in consumption and savings), partially paid by actual gains in productivity and investments, partially by a trade balance deficit.



Mexican crisis). The analytical model used in this report can also help the reader understand the optimal resistance of DIMs.

Minimized interest rate and prepayment risks for DIMs.⁷ This characteristic requires that the financial index reflect the actual composition of mobilized liabilities over the long-term duration of credit portfolios. In case of partial prepayment, it would be easiest to let contractual indexed payments proceed normally (no particular costs for the bank). The reduced balance would then simply shorten the expected maturity. Banks should discourage frequent and small prepayments (by fees or imposed minimum prepaid sums), but a limited prepayment ratio is unavoidable. It may even help banks to establish a small funding safety valve, in order to finance the growing portfolio balance more easily. Excessive prepayments, however, would make the cash flow management more delicate and would affect the size of the portfolio as well as the bank's profitability.

Credit risks can be minimized, relatively speaking, by the DIM's pattern of indexed payments. This judgment is relative to other credit designs (for similar clients, creditworthiness procedures, and collateral guarantees), provided that DIMs are properly designed (mostly through reliable indexes and reasonable first-payment-to-loan ratios, as explained below). DIMs will achieve no miracle in very adverse economic conditions, as there is no free lunch in mortgage designs. Thus, the flexibility of the amortization period may distribute the risks of DIMs more evenly, but these risks cannot be eliminated. The main danger specific to DIMs is the risk of an over-stretched term, and a resulting final capital loss (non-amortized capital in real terms). Careful design should help to avoid or limit this risk.

DIMs create higher liquidity needs—difficult asset/liability and cash flow management—due to the following characteristics:

- Their long-term nature (with usually shorter-term funding possibilities);
- An unpredictable capitalization of interests (depending on inflation and dual indexes), which ideally requires some corresponding indexed liabilities (for a deposit bank, sufficient growth of new deposits or sufficient rolled-over interests from current deposits); and

⁷ There is an underlying "natural" prepayment ratio, provoked by a sudden rises of income, or instinctive dislike of indebtedness towards banks, or interest rates too high when compared to net saving yields, or housing mobility (proceeds of resales). As DIM balances regularly decline in real terms, there is no particular additional reason to prepay them at an early stage (unlike "classical" credits). As interest rates are variable, borrowers find few advantages in renegotiating the financial terms, except for an initial high margin (not the case in Poland with limited three percent—five percent margins). If the maturity is not extended too much (for example, risk inherent to PKO BP's credits), borrowers should not feel any particular pressure specifically to prepay their DIM loans.

- Their variable cash flow and maturity (making it more difficult to mobilize capital market investors).

DIMs may prove to be resistant and profitable credits. But they are not simple. Good prior training is required to ensure technical competency on the part of those who manage DIMs, so that they can be properly underwritten, funded, and serviced. Most of the initial training by the Mortgage Fund focused only on the refinancing procedures. The Mexican experience has also highlighted the dangers of a rapid boom in various DIMs offered by commercial banks without minimum regulations and without close supervision of corresponding risks. In Poland, realistic simulating tools like “Pioneer” should be developed through clients and loan officers. Banks’ training efforts should be intensified at various levels (including basic to advanced DIM training modules).

The servicing aspects of DIMs are not detailed in this report (except for the need to track payment-to-balance ratios), although they may become a significant obstacle if banks have difficulty keeping track of the complex evolution of DIM flows. The usual procedures and computerized tools often appear inadequate to service DIMs (variable payments, variable maturity, negative amortization, etc.); any large-scale development would require lenders first to invest in the area of back-office facilities and equipment. No due diligence procedures or audits have ever examined the crucial servicing aspect of DIMs. The computerized tools offered by the Mortgage Fund are insufficient and inappropriate for the servicing of DIM loans by a primary bank; they are designed only to monitor refinancing lines.

The commercialization of DIMs may prove difficult, although it has been successful in some other countries with relatively difficult and unstable economic conditions. Counselors and loan officers should use realistic and simple computerized simulating tools (“Alicja” for PKO BP, “Pioneer” for the Mortgage Fund) to clarify and demystify some innovative aspects of DIMs (indexation of payments, capitalized interests, real amortization, variable maturity), through probable scenarios and examples. Clear and accurate information about borrowing households represents a very important element. Because the marginal utility of extended terms falls, options such as a capped maximum maturity should be considered, provided that the resulting risk is priced and limited (expressed as a percentage of remaining deflated debt to initial loan) and would remain small under adverse economic scenarios. (This report does not explore in detail the various possible marketing and commercial tools for DIMs.)

The accounting, regulatory, and fiscal environment must be adapted to DIM characteristics, both to ensure some satisfactory profitability for lenders and to install some regulatory and supervisory safeguards and tools for sound development of these credits and their lenders (capital adequacy, loan-loss reserves, deferred tax reserves, accounting



of capitalized interest, etc.). Before making final recommendations on these aspects, the functioning of performing DIMs must be analyzed, and methods and lessons identified.

DIM characteristics can represent a significant tool to expand mortgage lending in unstable and unpredictable economies undergoing a transition stage. Increasing the sustainability and affordability of mortgage credits supports the housing reform process and helps financial institutions to build a growing and secure portfolio of mortgage credits. If well designed, commercialized, and implemented, DIMs can be very effective during a transition period. Their design can reduce the expected level of inflation and play an important stabilization role. In both these respects, their contribution to a sound monetary policy should be considered. They can help to sustain an ambitious housing policy with private, market-oriented mechanisms. DIMs have been designed as a key element of housing policy in countries where inefficient subsidies were to be eliminated from mortgage credits during inflationary phases (Mexico, Turkey, Poland). The total portfolio of mortgage credits could at best represent 20 percent-40 percent of all banking assets, and 30 percent-70 percent of GDP.

As mentioned above, DIMs are complex and require precise underwriting rules. They should be closely supervised and, to a lesser extent, regulated. Their characteristics can either be exploited for the best or, at worst, have a negative impact on mortgage financing in terms of liquidity risk, credit risk, operational requirements, short- and long-term profitability of lenders, and capital adequacy requirements. In other words, if not well handled, they can fail to achieve their goals and lead eventually to a serious financial crisis, thus building some state contingent liabilities. The Mexican crisis has highlighted this inherent danger.

MAJOR DESIGN ISSUES CONCERNING DIMS

Election of Indexes

The choice of indexes is fundamental, as is the period of their adjustment. Ideally, indexes should:

- Instantly reflect the evolution of borrowers' incomes and the costs of lenders' funds.
- Be adjusted as often as necessary to reflect these changes (monthly or, failing that, quarterly).

- Be well known, regularly published, not subject to possible distortions, and easy to track and compare.

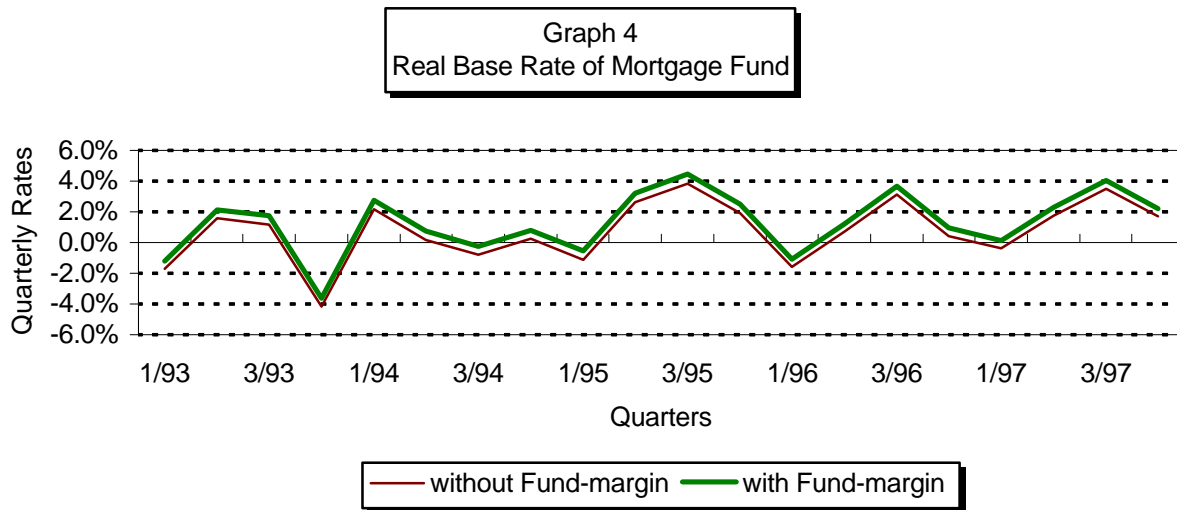
Specific Case of PLAM

One specific choice would correspond to a Price Level Adjustable Mortgage (PLAM), which only considers one unique index, directly applied on payments and on debt balance, amortized according to a fixed, predetermined “real” rate and a fixed maturity. The base to which the index is applied is usually either the rate of inflation (Consumer Price Index) or, in the Mexican Infonavit case, the Minimum Wage Index. PLAMs have been developed in Brazil, Colombia, Israel, and most recently Mexico. They may be problematic in Poland for two main reasons:

- The selected index, particularly if the CPI is used in order to protect a lender’s real yields, may far exceed incomes over a long period, which would result in rising effort ratios and increased defaults. This was the case in Poland between 1990 and 1992; in Turkey between 1979 and 1988, when purchasing power decreased by an average of five percent annually; and in Mexico after the devaluation shock of 1995. PLAMs’ indexed payments can thus result in massive defaults (such as happened in Brazil).
- The financial index is fixed in real terms, whereas real market rates often vary greatly in emerging economies (particularly, but not exclusively, when accompanied by inflation). Fluctuations and increases above 10 percent to 15 percent can occur during periods of scarce savings. Meanwhile, the funding costs of long-term lenders may rise above the fixed PLAM rate, thus exposing lenders to both major interest rate risks and financial losses.

Indexed Credit Interest Rates Applied to Outstanding Balances

The selection of an adequate financial index is critical for any variable-rate credit, not only DIMs. The presence of an impartial index represents a guarantee of transparency for long-term borrowers (rates changed only at the discretion of the lending bank). The selected index should vary according to the actual costs of available funds in the lending bank, although it should also be taken into account that the bank’s structure of liabilities may change. If the index meets this definition, the corresponding interest rate risks are minimized. Banks should closely watch the existing interaction between their various types of liabilities (which are still subject to significant differences over long periods) in order to control their exposure to interest rate risks and tailor the most adaptable financial index to their particular needs. Many banks, however, have not yet developed any control



policies to manage this risk. Furthermore, there is no optimal universal index that could be applied to all types of lenders.

Example of the Polish Mortgage Fund. Contractually, DIMs eligible for the Fund must apply the Fund's base rate, which would cancel any interest rate risk if the bank actually refinanced its whole portfolio by the Fund. This may not turn out to be the case, however, because banks may prefer to co-invest some of their other liabilities. (In any event, refinancing could not be fully realized, if only because of some minimum administrative delays during which DIM balances may rise.) Would the Fund's rate (based on Treasury Bills) also accurately reflect the costs of other mobilized funds? Partial refinancing is, therefore, not optimal, unless the lender benefits from alternative, cheaper funds.

Graph 4 illustrates the evolution of the deflated base rate (including the Fund's own margin). This evolution is still relatively chaotic, with some summer peaks (signals of tighter policy) and winter declines. The average trend is rising (quarterly actual rates are between one percent and +3.5 percent), and the yearly average is close to seven percent at the present time. The Polish economy is stabilizing through declining yearly inflation rates. On the other hand, further anti-inflation progress will become more difficult without significant efforts to alter the macro-economic fundamentals (further privatization, trade balance deficits, rising consumption, etc.).

The Mortgage Fund changed its financial index in 1996: the base rate was switched from the NBP discount rate to short-term Treasury Bills. This decision was made because at the beginning of 1995, NBP's rates rose considerably, as a result of a tighter monetary policy. Short-term and liquid Treasury Bills were considered a better and more stable reflection of overall financial markets. The interbanking market (Wibor) option was rejected, because this market was perceived to be too volatile, restricted to some smaller banks, not very liquid, and very short-term. This situation may change again in the face of new economic and administrative circumstances. For example, the income tax treatment of Treasury Securities may suddenly change, or the public deficit may plummet and drive Treasury Bills to increased actual yields (that is, larger increases than on deposit rates).

A slight modification has been introduced in the Fund's index to "simplify" procedures: it is modified only if its variation exceeds 0.5 percent. As long as rates decline, base rates may be kept artificially higher (resulting in longer maturity). But if inflation rates rise, the reverse effect is produced.

Financial Index of PKO BP's Mortgage Credits Since Mid-1995. PKO BP's common financial index is an average one year deposit rate from the largest Polish banks. This choice is adapted to the nature of PKO BP's liabilities (it is the largest deposit bank in Poland). It is also a transparent and popular index. The choice of an average built from banks other than PKO BP itself makes the index more impartial and stable for borrowers.⁸

On the other hand, deposit rates in Poland remain quite unstable in the short term. It is difficult to predict how they could rise in the case of any banking crisis (a liquidity or insolvency crisis). This index also does not reflect the possible regulatory changes of obligatory reserves, which would affect the actual costs of deposits. PKO BP's structure of deposits may also differ from this average index (in term and rate). Operational costs to collect deposits are supposed to be covered by the applied margin.

Diversity of Banking Situations and Strategic Financial Strategies. The selection of the financial index should take into account the expected future possibilities of asset/liability management, which should be considerably enlarged by the development of innovative instruments. Secondary mortgage markets could grow along with primary markets, using various management tools (direct transfers of portfolios, special collateralized securities, standard mortgage bonds, etc.). Capital markets would compare the corresponding risks and returns of mortgage credits with some conventional standards, based on risk-free and fungible assets (such as Treasury Bills or Wibor).

⁸ Yields on 12 month term deposits are relatively more stable than shorter terms, and this average base rate is calculated independently from PKO BP's own deposit policy.



In conclusion, there is no one optimal financial index. Adjustments may be required according to the funding strategy and possibilities of each individual bank. For example, there are major differences between a specialized mortgage bank, a small participating bank dependent on the Mortgage Fund, and a universal bank with abundant deposits. On the other hand, some minimum standardization is needed to facilitate funding by institutional investors, and some compromise between these two conflicting requirements must be found. Furthermore, the index should be watched on a regular basis, and if necessary, changed for the next generation of credits.

The Income Index Applied to Payments

A Mexican Case Study. The Mexican case illustrates the difficulty of finding a reliable payment index. From 1984 until 1994, the Minimum Wage Index was selected as a conservative estimate of household incomes. Actual wages were negotiated according to this index. DIM effort ratios were then expected to stabilize safely, or even decline. However, the government rarely adjusted the Minimum Wage Index, largely because of political and economic considerations. When it was finally adjusted, the effort ratios of borrowers faced large and hazardous fluctuations (long periods of declines, with some irregular jumps). In average real terms, this index had a significantly negative impact during the economic liberalization phase (yearly average less than five percent from 1988 to 1994), which lenders did not predict.

More interest was then capitalized without matching indexed liabilities for commercial banks, which were lending very affordable DIMs (with a low initial payment but large margins) to the top 5 percent to 10 percent of the wealthiest households. Problems were exacerbated by capped negative amortization imposed on DIM generations that originated before 1992 (when the cap was reached, borrowers had to pay full interest, which increased the likelihood of defaults). The diversification of other banking activities was then hampered because of the unexpected additional liquidity needs from DIM portfolios. Banking profitability was also affected by larger credit risks (such as residual unpaid balances despite extended but capped terms). The banks suffered from both cash flow problems and large numbers of defaults. The quality of commercial DIM portfolios became weaker, whereas the amount of DIM portfolios from 1991 to 1994 rose dangerously, by a factor of five (up to \$40 billion).

In addition to this unreliable payment index, problems were further exacerbated by the following (except for the FOVI public Program):

- Insufficient understanding of functioning of the DIM by primary lenders.
- Intense banking competition, increasing the pressure for affordability.

- Lack of secure standards set by institutional investors through secondary mortgage facilities.
- Lack of underwriting and supervisory safeguards.

When a devaluation crisis occurred in 1995, the portfolio was very adversely affected, reaching unsustainable levels. Many DIM credits could never be amortized. A large state program had to rescue these commercial DIMs in 1996 (including injected liquidity and subsidies on revised payments). By contrast, the publicly supported FOVI Program also funded DIM credits, which were more prudentially regulated and thus more resistant to the crisis (they did not need state rescue plans).

Before the crisis, in 1994 commercial banks instituted the CPI as the new payment index on the next production of DIMs, in order to capitalize less interest. This variant also failed when the devaluation shock occurred a few months later. As annual inflation and rates exceeded 50 percent in 1995, effort ratios jumped to “insolvent levels” and resulted in massive defaults.

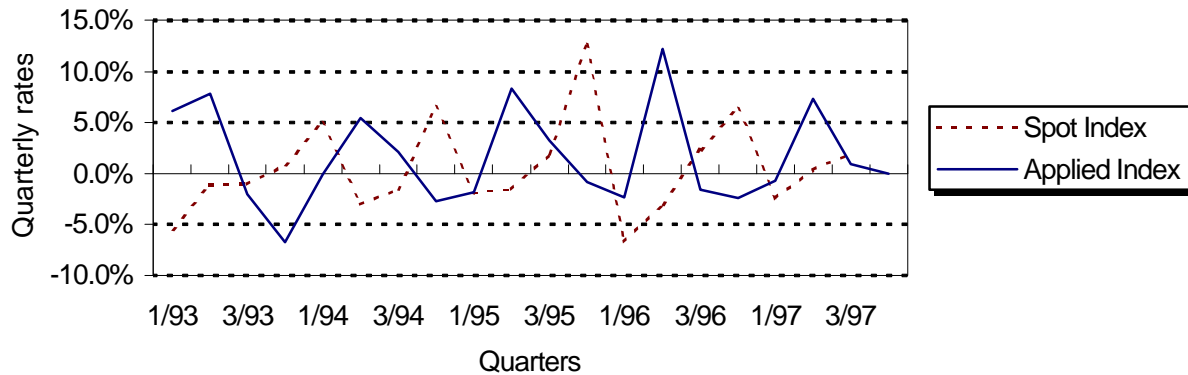
Clearly, any DIM index should attempt to avoid these two extreme cases (either an administrative index leading to cash flow problems and unpaid balances, or an aggressive index leading to defaults). The selected index should reflect the incomes of targeted borrowing households and should be published regularly without delays.

Payment Indexes in Poland. Both the Mortgage Fund and PKO BP use official statistics (from the Central Statistical Office: GUS), which can be considered fairly reliable. Both use an average wage index from some representative industrial sectors. This base may differ from the actual income evolution of mortgage borrowers in Poland (many of whom are independent workers in the tertiary sector). However, it should represent a reasonable compromise between (1) a conservative estimate of actual incomes (which should grow at least at the rate of this index) and (2) a required representation of the general macro-economic evolution of purchasing powers.

Wage Index of PKO BP. Before 1995, PKO BP had been originating and servicing different generations of subsidized mortgage credits, mostly to cooperative members, on behalf of the Polish government. Some of these products looked very much like DIMs, as they also indexed payments on borrowers’ self-declared individual incomes. The credit recovery was then significantly lower than the level required to eventually amortize such loans. DIMs were used instead to spread through time some extremely regressive state subsidies. However, the uncontrolled evolution of cash flows made the choice of DIMs irrelevant.

Since 1995, PKO BP has been developing its own portfolio of mortgage credits, including some DIM variants through its “normative” credits. PKO BP is applying regional

Graph 5
Deflated Income Index (Mortgage Fund)



wage indexes (from 49 regions) according to the locale of the lending agency. This approach has the advantage of offering a closer geographical match between borrowers' actual incomes and the index. On the other hand, regional indexes are adjusted according to certain administrative rules, to eliminate excessive differences from the national average. The monitoring of such DIMs becomes complex, however, as there are as many different DIM products as there are Wage Indexes.

Wage Index of the Mortgage Fund. Recorded wages are passed to DIM payments with a six-month delay, whereas the financial index is readjusted monthly from the previous month's rates. This time lag generates two minor consequences:

- As long as inflation declines, the applied index is increased, which slightly shortens the final maturity. DIMs are then no longer inflation-proof (in addition to the fact that some direct loss of purchasing power may result from wage adjustment delays).
- As wages are subject to strong seasonal variations in Poland (increasing during the fourth quarter), indexed payments are then applied during the counter cycle, which causes effort ratios to fluctuate, resulting in "hills and valleys," which are not particularly good for the solvency of borrowers. To illustrate the latter point, *Graph 5*, which depicts the quarterly variations of the Wage Index since 1993, shows wide seasonal fluctuations, with an average trend of increasing purchasing power.

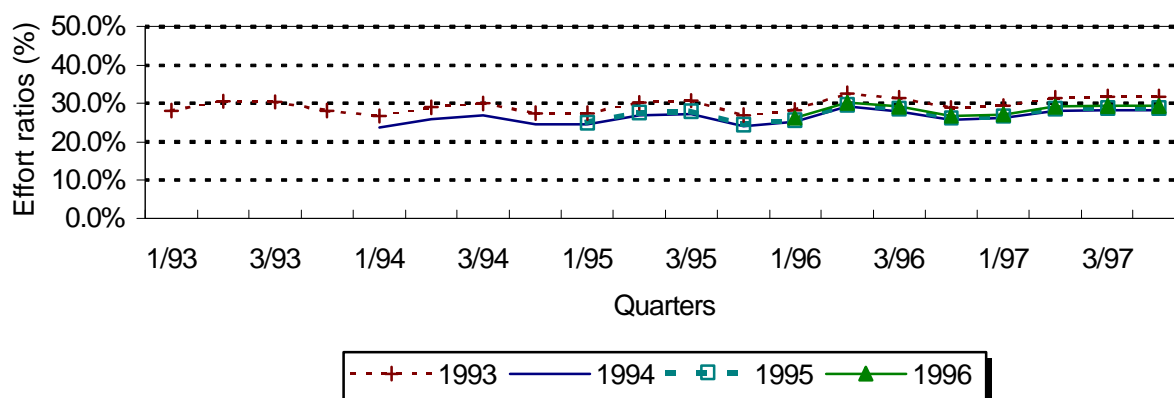
Graph 6 illustrates the resulting effort ratios for different generations of similar DIM credits, which have originated at the beginning of each year since the creation of the Fund



in 1993. Based on a targeted effort ratio value of 25 percent, the range of variations reached the equivalent of five percent (not dramatic, but consequential).

A minimum change of at least two percent in the quarterly Wage Index) is required to revise DIM payments. This provision tends to artificially raise the final divergence between both DIM indexes, as long as inflation is declining (if inflation rises, it has the reverse effect). This phenomenon is similar to the 0.5 percent minimum change required on the Fund's base financial rate. Both produce some minor (but not significant) distortions.

Graph 6
actual effort ratios (various vintages)



Absence of a Reliable Income Index. If no reliable income index can be identified, DIMs should not be developed. This was the main reason Hungarian authorities chose not to use DIMs (they used Deferred Payment Mortgages instead). Alternatively, a second best index for DIMs could always be implemented for the higher income deciles of the population (who represent the most likely initial wave of mortgage borrowers) using the latest monthly CPI, which could be applied to DIM payments with a deduction of a fixed security margin (for example, five percent annually). As long as yearly income increases remain more than five percent below inflation, effort ratios would stabilize or decline. This option differs from DIM partial indexation.

The final maturity would then depend only on the actual base rate, which would no longer be contingent on relatively volatile real wages. The resulting first payment ratio would turn out to be slightly higher than if the current Wage Index was used, but the credit affordability would not be reduced significantly. The fact that effort ratios should gradually decline (although less than with classical “tilting” credits) would be a major advantage,



which might improve the commercialization and security of the credit. Problems would still appear if a massive shock (for example, a devaluation) occurred.

Adjust Both Indexes in Case of High Inflation. In the case of continuing highinflation in Poland,⁹ both DIM indexes should be adjusted more frequently and without delay. This may then require a change of selected indexes. As a general principle, it is better to adjust both indexes together as frequently and as regularly as possible. Since biannual adjustments may appear inadequate when rates are unstable (due to lag effects, interest rate risks, sharp jumps in payments, etc.), quarterly or monthly adjustments are preferable. Under hyperinflationary conditions, weekly revisions make sense (although they result in higher operational costs).

Contribution of an Analytical Model for DIMs

Basic Model

In the basic model, the starting DIM payment is set according to the required loan amount, the projected maturity, and the expected divergence between the dual deflated indexes (the approximate gap between the cost of money and the evolution of purchasing power). It can be determined by the usual annuity formula, as applied to classical mortgage credits: first payment/loan (annuity factor) = interest rate/ [1- (1+ interest rate)^(-maturity)]; by replacing the interest rate; and by the relative divergence between financial and income indexes (similar in nominal and deflated values, and including the lender's margin). The formula is:

DIM first payment/loan = DIM divergence / [1- (1+ DIM divergence)^(-expected maturity)]
where the "DIM Divergence Rate" is equal to:

- (1 + expected credit rate) / (1 + expected income index growth) - 1, or
- (1+ real base rate)*(1+ effective margin) / (1+ real income index) - 1

This is approximately the expected (real base rate-real income growth) + nominal additional margin. If the difference between indexes varies, the resulting DIM divergence rate is not a simple geometrical average; a growing gap during the early years would have a greater impact than an equal one applied later on.

The DIM formula can be extended at any time during the amortization. Thus:

⁹ Unlikely, but possible, as long as the Polish economy is not stabilized.

$$\text{DIM payment/latest balance} = \text{DIM divergence} / [1 - (1 + \text{DIM divergence})^{-\text{residual maturity}}]$$

The DIM divergence rate may differ from the initial expected value because of some irreversible changes in the evolution of indexes since the origination of the credit.

Possible Uses of the Model

Any aspect of DIM underwriting, servicing, and monitoring can be predicted and visualized by means of a simple model, without unduly complex computerized simulations. Underwriters and supervisory authorities should use this model to estimate any proposed DIM credit conditions. Exact relations can be determined among the residual maturity, the divergence between DIM indexes (including the bank's margin), and payment-to-balance ratios (notably, starting payment-to-loan rates). Finally, one should not rely on a single optimistic economic forecast, but test the situation under several scenarios.

Following are some possible uses of the model:

- The first payment ratio is determined according to the expected evolution between DIM indexes, the bank's margin, and the expected maturity agreed upon with the borrower.
- The residual maturity and likely amortization can always be estimated.
- Prudential underwriting conditions can be determined and portfolios closely monitored.
- The scope of problems can be rapidly identified, as can the cost-effectiveness of any proposal.
- The impact on cash flows of any economic scenario can be rapidly visualized through payment-to-balance ratios and modified terms and balances.
- Break-even economic scenarios can be estimated for a targeted maturity.
- The impact of partial prepayments on the shortened maturity can be visualized.
- The impact of various margins on credit affordability and sensitivity can be directly visualized.
- The risks (and pricing) of the main DIM options (capped maturity, partial indexation, delayed index, etc.) can also be visualized (except for capped negative amortization).



A Few Simple Examples

Measurement of DIM parameters should be carried out according to the chosen frequency of adjustments (if quarterly, like the Mortgage Fund, all rates and margins should be expressed in quarterly equivalents).

Example 1:

- Yearly margin of the bank: four percent.
- Expected yearly gap between base indexes: three percent (one assumption among possible others).
- Expected maturity of DIM: 12 years (48 quarters).

As a result:

- The DIM yearly rate: seven percent.
- The DIM quarterly rate: 1.71 percent.
- The resulting first quarterly payment: 3.07 percent of loan.
- The resulting monthly payment: 1.02 percent of loan.

Example 2:

- Yearly margin of the bank: four percent.
- Observed yearly gap between base indexes: 0 percent (from last three years, expected to continue).
- First contractual monthly payment: one percent of loan.
- First contractual quarterly payment: three percent of loan.

Then:

- The DIM yearly rate: four percent.
- The DIM quarterly rate: 0.99 percent.
- The resulting maturity: 40.6 quarters or 10.2 years.

RECOMMENDATIONS FOR SOUND UNDER-WRITING AND SUPERVISION

Illustration of DIM Behavior

Graph 7 shows the exponential evolution of the residual maturity in years according to (1) monthly payment-to-balance ratios (monthly payments quarterly adjusted); and (2) the assumed yearly average DIM divergence (lender's margin included). The initial expected term announced to clients and the contractual first-



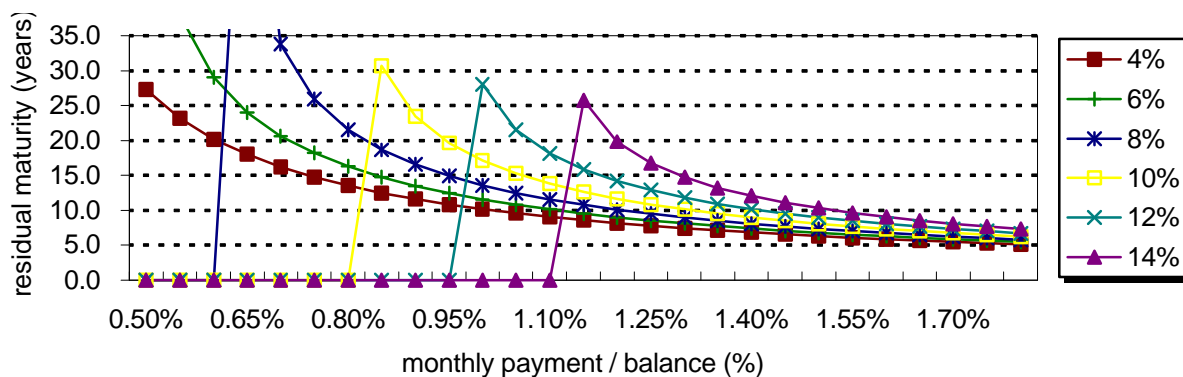
payment-to-loan ratio would represent one particularly important case. The main analytical points and conclusions include the following:

- The best monitoring tool for DIMs is frequent observation of the payment-to-balance ratios.
- The residual term is exponentially tied to this value. Any supervisory or regulatory authority (general banking entity like NBP or specific refinancing authority like the Fund) should require periodic statements, with corresponding break-evens, according to different generations of DIM credits.

The variable maturity is a limited protection because of the risk of residual non-amortized balances. Under adverse conditions, DIMs may trigger their mechanism of extended terms but with some marginal and asymptotic effects. At one critical moment, the maturity may overextend without improving the evolution of payment-to-balance ratios (which should continue rising in order to amortize the credit).

No extension of maturity (even infinite) would be sufficient to compensate for a major economic crisis, reflected by an actual DIM divergence rate exceeding the latest payment-to-balance ratio. As an example, if the margin is 5 percent and the Mortgage Fund's base rate exceeds the Wage Index by 4 percent, the monthly payment-to-balance ratio should always exceed $(1 + 9 \text{ percent})^{(1/4)} - 1 / 3 = 0.73 \text{ percent}$, in order to amortize the DIMs. Below this level, the credit will not fully amortize, and corresponding loan-loss reserves should be made (still limited if made at an early stage). Actions should be taken (as explained further below. The more this limit is exceeded, the lower the net profitability

Graph 7
Maturity, Payment/balance and indexes



(the net present value of cash flows). Should the maturity extension be contractually



capped (as is preferable for financial and commercial reasons), payment-to-balance ratios should stay at higher levels.

If payment-to-balance ratios cannot be watched with minimal delays and satisfactory accuracy, the proposed model could be applied after an intermediate additional step simulating the latest payment-to-balance ratio from initial contractual conditions (starting-payment-to-loan value) and the historical evolution of indexes since the origination. Results would be less precise, however, as they would not take into account possible late payments, change of indexes, specific arrangements on payments, or prepayments.

A possible underwriting methodology. DIMs may be self-adjustable credits, but in order to ensure a safe amortization process, underwriters should still make a conservative assumption on the average divergence between DIM indexes (expected real rate plus margin minus expected purchasing powers). A minimum first-payment-to-loan ratio should be set accordingly, while assuming a reasonable maximum term (preferably 20 years). Even with reasonable banking margins (four percent), DIMs may not behave safely with extremely long maturity terms (particularly above 20 years, certainly above 25 years), as they become too sensitive to any unexpected, unfavorable change in DIM indexes (quite visible through Graph 7). This situation is likely to lead to unpredictable cash flows, larger funding needs, over-stretched terms, and possible final credit losses. This effect is exacerbated by very large margins, as discussed below.

DIMs should not be designed to operate with very long maturities. They function better as medium-term credits during a phase of economic transition. The horizon of economic visibility in Poland cannot be very long, and households may feel reluctant to borrow on long-term conditions. Expectations regarding permanent income, other savings goals, and uncertain costs are all pertinent factors in this context.

Another key DIM feature results from the greater importance of early years over later ones, caused by the amortization process. Excessive starting payments may then reveal major problems, particularly if an economic crisis occurs during the early years of the loan's life. On the other hand, very large and adverse shocks would affect "old" DIMs relatively little. A substantial economic shock (in length and magnitude) would extend the final maturity longer if it occurred during the first three years following the origination than if it occurred later on. This consequence is attributable to the fact that the higher DIM rate would be applied on higher payment-to-balance ratios, as depicted in *Graph 7*.

It is preferable to make conservative assumptions concerning the expected DIM divergence rate when establishing the first payment ratio, making the announced maturity relatively shorter. Simulating tools should be cognizant of this aspect, and they should also avoid assuming a large decline in inflation rates (in order for clients to understand and accept the capitalization of interest).

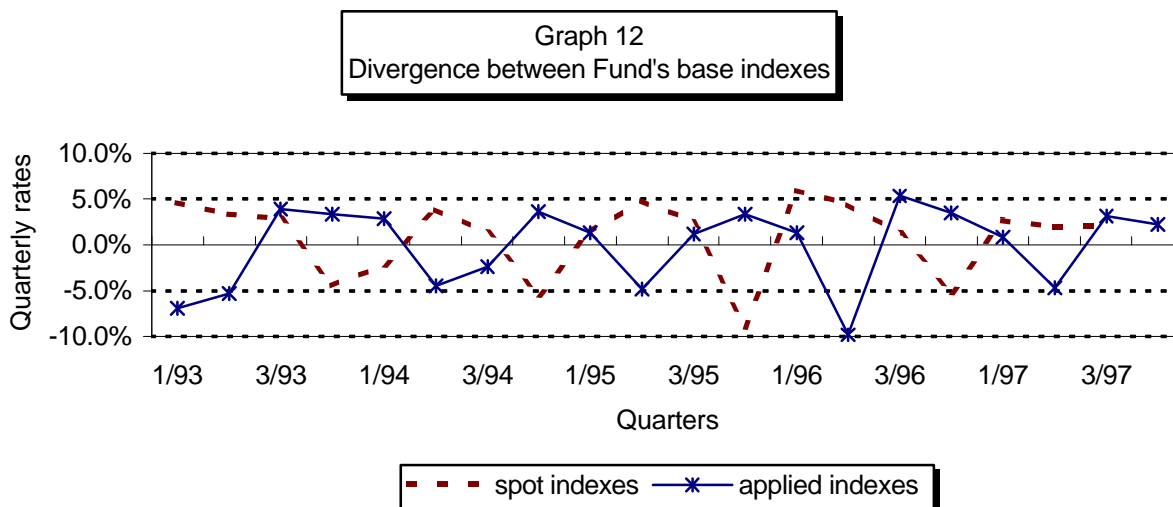


The DIM's characteristics may also require capping the initial loan-to-value ratios, as there is a small risk that nominal housing values may fall below credit balances, which would certainly trigger more default risks. Such an event would simultaneously require a sudden adverse drift between indexes and deflated housing prices during the early years of a DIM's life. On one hand, the risk is certainly larger for DIMs than for classical credits (with regard to paid interest, whatever the form of capital payment). On the other hand, the risk is no higher than that carried by a classical credit in a no-inflation economy. Standard loan-to-value limits should therefore be adjusted according to the enforceability and foreclosure of the mortgage title rather than as a function of a DIM's specific conditions.

Recently Applied Credit Policies Worldwide for DIMs

The Polish Mortgage Fund. Mortgage Fund DIMs were initially targeted with a maximum 25 percent effort ratio. They were commercialized until 1995 with maximum amounts equivalent to 36 times borrowers' gross monthly incomes. Such loans would require a 0.69 percent first-monthly-payment ratio, which would lead to excessive terms and final losses if the average divergence between the Fund's rate and the Wage Index exceeded four percent (with another four percent lender's margin). This level of disparity is, in fact, a plausible scenario; in Western economies, the difference often exceeds four percent. In emerging economies, the real base rates vary more and differences can exceed 10 percent.

The Fund has since imposed a minimum first-monthly-payment ratio of 0.92 percent, which should keep final terms below 13 years, given the historical trend of the indexes, and below 20 years under more "unfavorable" economic conditions (the credit is still amortized if there is a divergence of an additional 10 percent between indexes). The historical evolution of DIM rates (including the Fund's margin) is described in *Graph 12*.





One period may be characterized by favorable increases in purchasing power (this effect is more important than actual low financial rates). A subsequent economic phase could differ, with perhaps more stabilized real incomes, but rising real rates. There is no possible “right forecast” in these matters, however. The past cycle cannot be considered a safe forecasting base. Underwriters should apply various scenarios to test their impact on resulting DIM cash flows, and they should maintain a conservative worst-case scenario through the average DIM divergence.

PKO BP’s “Normative” Credits. These credits are actually DIMs, and they differ from PKO “indexed” credits (partial indexation). The first-payment-to-loan ratio on the initial 1995 generation was: $2/350 = 0.57$ percent (it has been changed since then). Even supposing deposit rates are equal to the Wage Index, maturity is 22 years (for a contractual four percent margin). And if deposit rates exceed the Wage Index by only two percent yearly, maturity is 35 years. At three percent, the credit is never amortized, unless borrowers are “strongly advised” to pay more than the indexed sums (contractually presented as a required minimum). But cash flows then become unpredictable. The ratio was raised to 0.75 percent for the next generation. This ratio is better able to resist shocks, although credits still would not amortize if deposit rates exceeded the Wage Index by six percent.

Various DIMs in Mexico. During the last 15 years, Mexico has had more experience of DIMs than any other country. There has been a particular boom since 1991, mostly driven by the following:

- **The FOVI Program**, targeted at medium-income borrowers. FOVI is a funding facility that, since 1984, has been monitored by the Central Bank, which finances DIMs lent by banks and backs a portion of the final credit risks. The Minimum Wage is the payment index, and the CPP (average banking cost of funds) is the financial index. Lenders’ margins are regulated (this used to be forbidden, as banks could charge only regulated fees for the origination and collection of payments). The minimum first-payment-to-loan ratios have recently been 0.75 percent and 0.90 percent respectively, with and without regulated margins.
- **Competing commercial banking credits** for higher-income households (the top 5 percent to 10 percent of the income distribution). Until 1995, most “commercial DIMs” were also indexing payments according to the Minimum Wage Index. Their base financial index was either the CPP or CETE (1-month Treasury Bill). They could sometimes switch from one to another, according to their discretion. They applied large margins on DIMs (more than 10 percent until 1993, still about six percent-seven percent). The minimum first-payment ratios were relatively low (between 1.0 percent and 1.3 percent). By law the maximum maturity was capped (from 20 years

initially to 30 years since 1993). The state initially covered any debt after this period, but this provision was abolished in 1991 (except for FOVI). Yearly and monthly divergence rates between the CPP and Minimum Wage are depicted in *Graphs 13 and 14*. The figures vary between nine percent and 24 percent (with an average of 16.7 percent, net of any margin). These high levels are due to irregular and limited administrative readjustment of minimum wages.

The level of non-performing DIM loans, together with an explosive growth in portfolio, had begun to rise dangerously by 1994 (already eight percent of the total portfolio in July 1994, and 16 percent after the 1995 devaluation shock). According to our model, minimum payment ratios should, on average, have exceeded 1.4 percent (without accounting for the margin in the applied credit rate)¹⁰ and two percent (if margins were accrued in balance), even if applying the maximum maturity (30 years) since 1993. Different results would be found according to the exact date of the production. Tighter safeguards should have been imposed, particularly on older generations (because of higher margins and negative amortization caps). Banks, however, fell far short of meeting such standards, and they were left unregulated and unsupervised in these matters.

Commercial banks did not realize until too late the effects of diverging rates on their DIM portfolios.

One bank, inspected during a World Bank mission in 1994, was found to just straight-line the current spot interest and inflation rates when modeling its DIMs. Mexican banks tried to adjust their underwriting conditions in 1993 by introducing longer maturities and lower margins, but this move was still insufficient to restore the quality of DIM portfolios. Meanwhile, the portfolio size was growing rapidly because of sustained new production by competing banks and an excessive capitalization of interest, which resulted more from unexpectedly diverging indexes and careless underwriting standards, than from inflation, which was fairly low between 1991 and 1994.

The 1995 devaluation was, then, what finally detonated the long-standing “perpetual debt” bomb, gradually built up through formerly excessive capitalization of interest. The divergence between DIM indexes in 1995 was very wide (the CPP was 52 percent and the Minimum Wage Index 17 percent). A costly public program in 1996 had to rescue the portfolio of commercial DIMs by injecting long-term funds, revised credits, and subsidies on payments in an attempt to save the banking system. The consequences for the banking and housing finance systems have been dramatic. These subsidies may be necessary, but they are regressive and generate moral hazard among households and banks.

¹⁰ This was paid separately as a servicing fee, not subject to interest capitalization.



The devaluation shock of 1995 could have been absorbed through DIM balances had the earlier DIMs been more safely underwritten. The DIM's inherent design would have enabled payment-to-balance ratios above 1.5 percent (net of margin) to resist this brutal but temporary shock. In Mexico, however, in a climate of growing competition for "affordable" mortgage schemes, overly optimistic assumptions were made regarding the evolution of indexes without corrective measures being taken by supervisory authorities. To be maintained, DIMs must operate in a safe zone, using conservative assumptions and following a realistic vision of the instrument's specific behaviors and possibilities. Problems originated from a number of sources:

- An unsuitable choice of income index.
- An excessive development of DIMs outside a workable underwriting framework.
- A lack of standards and safeguards (neither specific supervision, nor a secondary markets facility, nor institutional investors in a funding role).

Some Mexican banks also reacted before the crisis by launching a new production of DIMs, which used CPI as a payment index (the "Espacio" credit by Banamex was the first) to replace the failing Minimum Wage Index. A devaluation shock occurred a few months after this change, when loan-to-value ratios were still high and payment-to-balance ratios still low. The economic shock severely affected borrowers' incomes (and not only Minimum Wages), which in turn drove the effort ratios of these inflation-indexed DIMs to insolvent levels, requiring the state to come to their rescue in 1996.

The FOVI program is said to have experienced fewer problems because of its safer regulatory DIM design, and therefore to have had greater resistance (although no data is yet available). The model suggests that most of the DIMs issued by FOVI should be close to allowing a full amortization process.

A Case Study of French DIMs. DIMs were introduced in France in 1988-1989, not as inflation-proof affordable instruments (as inflation was then very low in France) but rather to compensate, by indexed payments, for some unpopular variable interest rates. The situation was made worse by a quasi-monopoly of fixed-rate classical credits, which conveyed dangerous interest rate risks and prepayment and liquidity risks for lenders.

One DIM product ("Foncier Delta" by Crédit Foncier de France) selected the Index of Construction Cost (ICC) as a payment index. The ICC, which is applied to cap certain rental housing adjustments, has historically been close to inflation rates. Other lenders applied other indexes close to inflation (in France inflation cannot be directly indexed in financial products, to limit inflation-fueling anticipation). Foncier-Delta's rates were adjusted on a one-year Pibor (interbanking market), whereas other popular short-term

variable rates were applied to other commercialized variants of DIMs. First-payment-to-loan ratios were then adjusted to a maximum level of affordability, as underwriters assumed that the DIM rate should remain inferior to the spot level of real monetary rates (then at an all-time peak of 6 percent-6.5 percent). However, the product was introduced at the wrong time because of the following:

- The curve of financial yields started to reverse (long-term fixed rates declined below short-term rates), which did not make DIMs very commercially attractive.
- Real financial short-term rates continued to increase in 1989 (to 7.5 percent-8 percent).
- The ICC was lagging slightly behind inflation in 1989 (1.5 percent versus three percent).

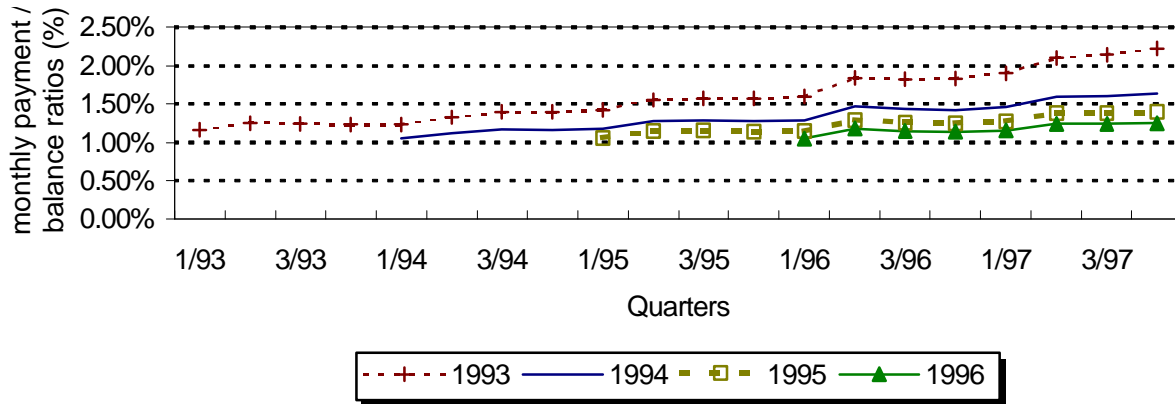
In fact, the rate of divergence rose by an additional premium of three percent during the first year of production.

If this trend was to last, the final maturity would extend by more than five years beyond the maximum contractual extension. This evolution reversed after a while, and DIM portfolios did not face any adverse consequences. Yet a conservative margin of security should have been included. In addition, ICC-indexed DIMs were used by professional rental investors, whose clients were riskier than individual borrowers purchasing a principal residence.

The next generations of DIMs applied lower and more stable financial rates with longer periods of adjustment (five years). Many other mortgage products in France have indirectly used DIM characteristics—applied indexed payments and variable maturity—rather than a possible switching or capping option along the lines of more classical payment patterns (triggered if interest rates rise too much). This latter approach constitutes an interesting model.

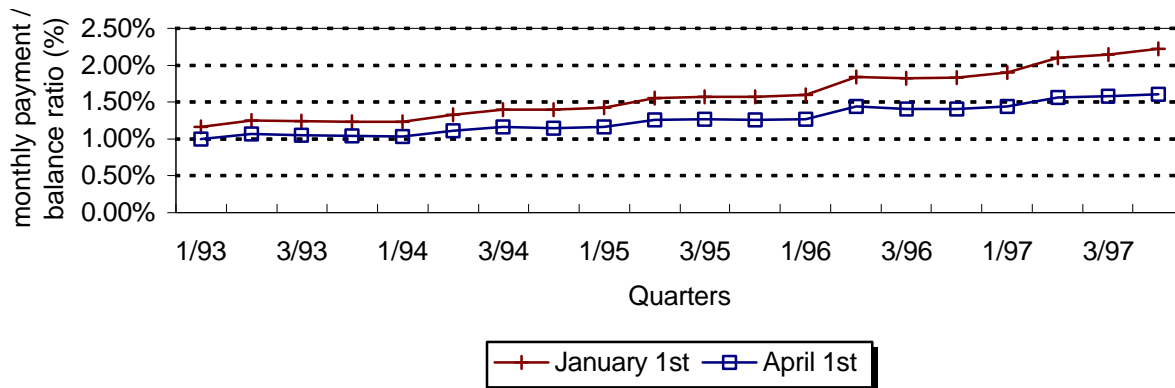
Examination of Historical DIMs in Poland. Analysis of historical data can examine both the evolution of DIM indexes and their impact on various DIM generations through the development of their respective payment-to-balance ratios. These ratios are expected to rise—initially quite slowly and then at an accelerating rate—during the loan's life. If they stabilize and decline, the credit term may require a long extension and/or may not fully amortize. *Graph 8* illustrates a typical DIM (first payment: one percent), originated at the beginning of 1993, either with an immediate first quarterly indexation of payments, or a deferred indexation to the second quarter. Examples of other DIMs are included between these two cases, based on their exact origination date. Their actual evolution has been favorable, despite limited seasonal variations.

Graph 9
Payment/balance of various vintages



Graph 9 extends this simulation of payment-to-balance ratios for all DIM vintages

Graph 8
Payment/balance of 1993-vintage



between 1993 and 1996 (assuming immediate indexation since the first quarter). All generations show a gradual and reassuring rise (yet a bit less favorable for the latest generation). Graph 10 shows the corresponding evolution of deflated balances, which normally and safely decline (again despite seasonal short-term moves).

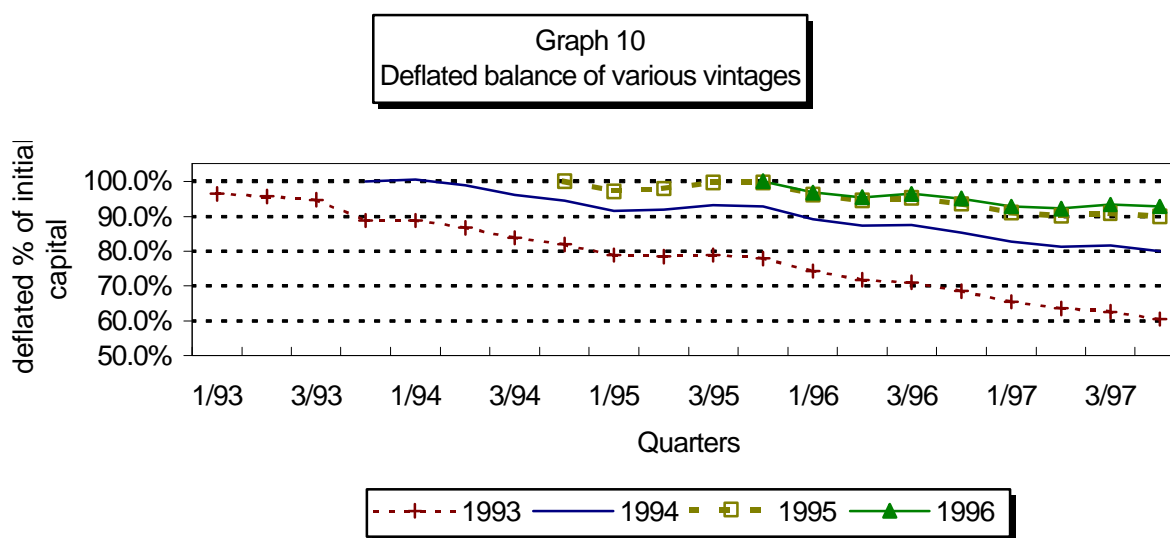


DIM Parameters and DIM Funding

Danger of Excessive Margins. The model can show how the margin is included in the DIM average divergence rate, which directly influences the relationship between payment-to-balance ratios and the variable maturity. The larger the margin, the more sensitive and less affordable the credit (*once again, see Graph 7*). A free determination of even high margins should still be encouraged, however, in order to allow banks to pay for the following:

- High and uncertain operational costs (for example, new entrants, with large preparatory and servicing needs).
- Large and unknown credit risks during the emerging phase of mortgage credits in Poland, while their portfolios are still limited.
- The need to return satisfactory results as expected by shareholders and as necessary for their internal growth.

For the time being, growing competition has kept margins at relatively insufficient rather than excessive levels. Still, if margins were rising rapidly, some compromise on profitability should be found, to take into account the resulting reserves and losses in the



case of excessive margins. To minimize the risks created by high margins, banks could reduce affordability through shorter terms or higher initial payments, which would thereby decrease the oversensitivity. If this were not possible, the payment of margins could be separated from the accrued interest of the debt balance (that is, the margins actually



paid for servicing costs, not partially capitalized as part of overall interest). The amortization would then not depend on this high margin. However, overall effort ratios would no longer be stable, but would have higher initial values and thus lower overall affordability). This approach, which is efficient when margins are high, has not yet been undertaken in Poland.

Monitoring Tools and Reserves on DIM Portfolios Under Adverse Circumstances. Payment-to-balance ratios may face unfavorable drifts in the case of unexpected divergence between the dual indexes (rising real rates and/or collapsing real incomes). As explained above, the extended maturity only marginally compensates for this effect beyond a certain critical point. If the evolution is just seasonal (see prior examples in Poland), no reaction is needed. The change should be observed during similar periods, because the corresponding indexes are responding to seasonal effects. The resulting expected residual maturity may appear to fluctuate from one period to another without much consistency on a period-to-period basis. However, *average* trends in various respects should be observed: for example, during the latest year, or since the credit origination, or according to a recent evolution.

If an adverse trend looks serious, the model can project the revised extended residual maturity. If this maturity becomes too long to enable full amortization, action should be taken without further delay. One approach would consist of voluntarily lowering a bank's margin, to enable DIM amortization through reasonable extended terms. The model provides decision makers with a proper quantitative assessment in each case. Expected short-term profits may diminish, but accrued final ones will not. The servicing would not be much altered. Additional reserves may or may not be required.

Another solution (not incompatible with the previous one) would be to suggest that lenders encourage their clients to partially prepay their credits. Doing so could help raise the corresponding payment-to-balance ratios to sustainable levels of amortization. PKO BP suggested this solution; it may or may not work on an entire endangered portfolio. The bank may also propose to its clients changing the payment index to speed up payments; however, clients may reject this proposal, and an excessively aggressive index may lead to defaults.

Under adverse circumstances, supervisors should obligate banks to establish some special loan-loss reserves (different from those required when clients do not repay, which are discussed in the next point). These "additional" reserves would correspond to the net present value of the projected residual balance after a given maximum period of extended maturity (for example, the initial term plus five or seven years). They should be maintained as long as the payment-to-balance ratio has not improved enough to permit full amortization in the future. Improvement may come about for various reasons—for example, thanks to a more favorable cycle of indexes—or from specific

actions agreed upon by the parties. Reserves could be reduced by a corresponding write-off of the debt. Supervisors should periodically watch the evolution of payment-to-loan ratios and the assumptions made by lenders in regard to expected DIM rates. Such reserves should be tax-deductible, in order for banks to be encouraged to establish prudential reserves in the early stages.

Prudential regulation for late payments. These prior “DIM-specific” reserves should not be confused with “classical” loan-loss reserves, which are required when a credit is not repaid according to contractual obligations. DIM credits should follow the general existing prudential regulation of credit risks. NBP has determined these standards, and its inspectors check for their application. The Polish system requires proportional loan-loss reserves of credit balance according to the length of the delay in payments in the amount of 20 percent if over one month late, 50 percent if over three months late, and 100 percent if over six months late. Such legitimate requirements should be applied to overall DIM balances (capitalized interests included). But the current system still differentiates the initial capital from capitalized interest, which, as interest, immediately requires 100 percent loan-loss reserves. This requirement should be relaxed.

Other options are open for all housing mortgage credits, when compared to other credits. Should the common procedures for loan-loss reserves pertaining to their amount and tax-deductibility and for capital adequacy requirements be applied to DIMs as well?

The considerations include the following:

- Supervisory institutions may consider the current period risky for mortgage credits in Polish banks.
- Very unstable economic conditions could overwhelm the DIM’s self-adjustable design.
- Inexperienced competing banks may have limited funding possibilities.
- Inefficient debt recovery instruments exist in Poland, in particular, for mortgage foreclosure and eviction.

On the other hand, mortgage credits present relatively favorable performance records. The percentage of non-performing loans is usually low. The proportion of forced collateral sales is often lower than 0.1 percent. Resulting net losses (all costs included), expressed as a percentage of the margin, are often moderate (much less than 0.5 percent), provided that credits are well underwritten, funded, and serviced.



The following proposals attempt to apply international experience to the Polish context:

- In many Western countries, capital adequacy requirements for housing mortgage credits are divided by two (50 percent risk-weighting on credit balances, including capitalized interests). This exemption is often not extended to riskier categories of mortgage credits (for construction or commercial property loans). The situation is reversed in Poland, where only commercial property loans benefit from lower risk-weighting. One major reason for this is that under the previous system, mortgage borrowers could not be evicted without substitute housing. As this situation changes, the amount of imposed loan-loss reserves could similarly be divided by two.
- Loan-loss reserves on mortgage credits should be immediately tax-deductible. This is not the case in Poland, as some elements of foreclosure procedures are required to have been started. This disposition is not justified, however, as the vast majority of non-performing mortgage credits find solutions other than a forced judiciary collateral sale. This latter solution rather represents a necessary last-resort deterrent. The prudential entrance of Polish banks into large-scale mortgage finance represents quite a costly venture before a profitable portfolio is achieved. Net results should not be worsened by nondeductible reserves. Otherwise, banks may try to hide these reserves by artificially readjusting their credit conditions.

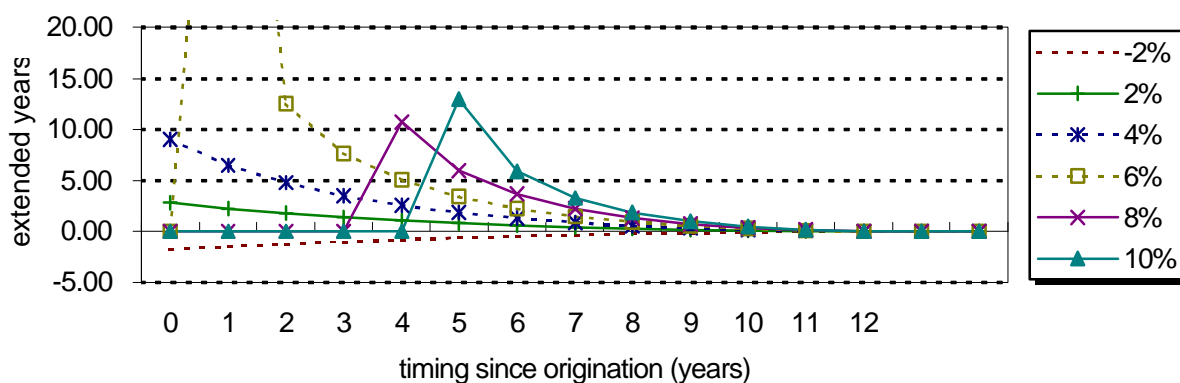
Analysis of DIM Resistance to Shocks: Possibilities and Limits. The pattern of DIM amortization is modified by changing the divergence between DIM indexes. The more detailed comments below elaborate on this aspect:

- Economic shocks are significant only if they change the relative average difference between indexes. Both the timing and the magnitude matter: the earlier, the more important the divergence. Very large adverse shocks would not significantly extend the final maturity if they occur at a late stage. Thus, older generations of DIM credits are more protected than more recent ones, which deserve more attention. The duration of the shock also matters. A brutal but short shock (high real rates and falling purchasing power), may be better absorbed by DIM mechanisms than a smoother but longer-lasting drift.
- Using the same DIM example as above (one percent initial first payment, three percent expected difference between base indexes, plus a four percent margin of the lender resulting in a seven percent expected DIM rate), the impact on amortization of a shock equivalent to an additional five percent difference in the indexes is as follows:



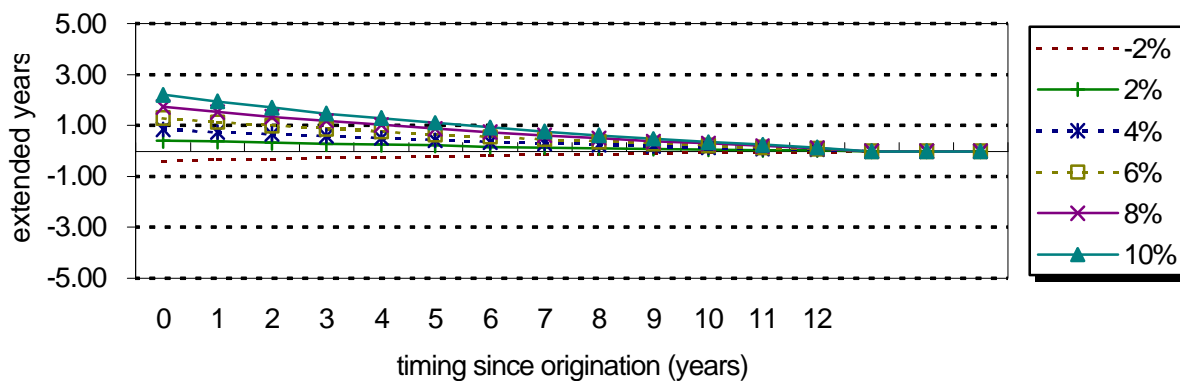
Timing of Shock (after origination)	Length of Shock	
	Only One Year	Permanent
0 Years	1.1 Years	20 Years
2 Years	0.8 Years	7.4 Years
4 Years	0.6 Years	3.6 Years
6 Years	0.5 Years	1.8 Years
8 Years	0.3 Years	0.7 Years

Graph 11-A
Permanent shocks



This example is generalized in *Graphs 11-A and 11-B*, which depict the resulting changes of terms for this DIM credit according to diverse shocks (*Graph 11-A* measuring the impacts of permanent shocks, *Graph 11-B* of shocks lasting only one year).

Graph 11-B
Short-term shocks (last 1 Year)



Nearly any short-term shock would be absorbed by the DIM mechanism; even a sudden 20 percent shock, triggered by a devaluation, for example, would require less than five extended years. Unexpected long-term shocks would also be kept under control, if they occur during the second half of the DIM's life. If a lasting negative evolution happens during the critical initial term (Three to four years), the variable term could only absorb limited but significant shocks equivalent to an additional yearly four percent. Beyond this limit, DIMs may not be amortized, and special reserves should be made. The limit would be higher for higher monthly payment-to-loan ratios (preferably superior to one percent).¹¹

Such sudden crisis scenarios are always a possibility, even in Poland (if real rates keep on rising, and real wages are constrained). Polish underwriters should examine the impact of various scenarios on DIM cash flows and final term, including one relying on a gradual stabilization of real wages and a rise in real interest rates. A deep countercyclic economic downturn is also unlikely, but not impossible in Poland.

Finally, it is not worth overextending the possible maturity of DIMs, as the marginal utility of any additional extended year declines to infinitesimal values in relation to payment-to-balance ratios and amortization. Most of the contribution made by an extended term is completed after five to seven years. Beyond this range, households may make further efforts, but additional payments would not appreciably amortize the

¹¹ In Turkey, yearly real wages declined by an average of 5 percent between 1979 and 1988 (by 2 percent between 1979 and 1990). Mexico experienced both a long-term drift between the two applied indexes and a brutal final blow (more than 20 percent divergence). In many emerging countries, real rates can easily exceed 10 percent.

deflated balance. Some obvious commercial reasons would also plead for capping the extension.

Capped Maturity Option. An appealing contractual option would be to cap the maximum maturity of DIMs under any economic circumstances provided prior due payments had been correctly made to the bank. The extension could be limited to five or seven years, to be added to the initial announced term. The bank would then take a very small additional credit risk, if initial payment-to-loan ratios are safe. In Poland, the payment-loan ratio should then stand above 1.1 percent (according to the applied margin).

A possible variant would share the costs of this option (a final write-off of any residual balance) through a public guarantee. Public involvement would be offered only to lenders offering DIMs that are deemed to be prudent. This support could be seen as economic insurance, to be used only if the current stabilization process fails and if inflation recurs. In the worst case, the guarantee should represent only a very small percentage of the net present value of the initial capital.

Capitalization of Interest. The capitalization of interest should not be capped. As long as payment-to-balance ratios do not decline, a large accrued amount of negative amortization would simply reflect the expected functioning of DIMs in a high inflation environment. A cap would break the indexed pattern of payments and might lead to higher effort ratios and defaults. This option was initially used by Mexican authorities before being abandoned after 1992. Should the amortization process be threatened, the negative amortization might be excessive; however, this fact would reflect an improper initial design. Other remedies should be applied.

Partial Indexation Option. If inflation is relatively moderate, certain DIM variants may be implemented. One version is to index payments only partially (on an income or inflation index). This variant was developed in Mexico (70 percent on the Minimum Wage), before being abandoned. Since 1995, PKO BP has developed a variant of "indexed credit": during a preliminary phase, payments are only indexed according to 50 percent of the evolution of the financial base rate; if monthly payment-to-balance ratios then fall below 0.75 percent, a next phase of integral indexation is planned.

Such variants look attractive during a preliminary phase (declining effort ratios), but they lead to a dangerously sensitive next phase, as the DIM rate still contains an element of residual inflation (the non-indexed part), which can turn out to be volatile and large. Future cash flows and final terms are then blurred, and credits no longer inflation-proof. A prudential lender should set a large premium on overcoming this danger (expected future inflation), which would be included through some higher first-payment ratio (with a 50 percent indexation, 1.5 percent rather than 1 percent). The resulting

credit affordability would then be affected. At one stage of moderate inflation, the complexity of these credits might not be worthwhile compared with more simple classical credits. A less prudent lender might take far larger risks on the future amortization of these credits.

One solution, used by PKO BP, consists of a backup clause of full indexation, if payment-to-balance ratios fall below a given break-even threshold (notably, if inflation does not decline enough). However:

- The product is quite complex to commercialize;
- The second phase may generate rising effort ratios and thereby increased risk; and
- The maturity and cash flows are uncontrollable (depending on inflation) for both borrower and lender.

Only banks with large liquid funding possibilities could afford to develop such products. Any partial indexation should therefore be very carefully implemented. Preferably, this should be avoided, or implemented with a large minimum percentage of indexation (about 80 percent in Poland). A safer option could be developed (as mentioned above) through deducting a fixed margin of security from an integrally applied index. In this case, credits are made independent of changing inflation rates. Another variant is to propose a DIM pattern as an option on payments to be exercised on classical variable-rate mortgages, when credit interest rates exceed some unaffordable value. This choice has been proposed in France, as one option in a package of various options.

Management of Larger Liquidity Risks. No general recommendation can be made regarding this issue. The rule is that DIMs leverage specific and larger funding needs, which may find different but adequate answers according to each bank's situation and strategy. Long-term liquidity risks should be incorporated in the more general concept of cash flow management, because both the maturity and balance of DIM credits may vary considerably. The corresponding net balances should always be matched by sufficient liabilities, whose cost of funds should be fairly priced by the applied financial base index. The most adequate funding resource would be similarly indexed liabilities, with similar flow characteristics (that is, indexed repayments, with some deferred interest and a variable maturity).

Matching by a Secondary Mortgage Facility like a Modernized Mortgage Fund. Such a facility might be the Mortgage Fund, whose long-term lines to participating banks are parallel to DIMs, including some negative amortization and possible variable terms. For one year, the Fund has proposed collectively refinancing certain pools of

DIMs. Most prepayment risks are also passed through the Fund's lines. This solution to cash flow risks is made possible by budgetary contributions to the Fund. However, its actual refinancing conforms to a strict administrative structure, in terms of both eligibility and procedures, which Polish banks have often perceived as constraining despite recent progress. This partially explains its modest disbursements.

The Fund has played a pioneering and leading role for the promotion of DIMs in Poland. It has also participated in training and marketing efforts in addition to its refinancing mission. Another positive outcome has been the promotion of key concepts and standards related to DIMs, at least among developers and active Polish banks, even if they do not use its funding (like PBG, PBK, etc.). PKO BP—a major DIM originator—has strengthened its standards. Refinancing institutions are useful instruments for reducing financial risks leveraged by mortgage credits, particularly DIMs. They can propose safe benchmarks to secure standards during a phase of growing banking competition on complex products. Their usefulness does not diminish when capital markets are mobilized to fund mortgage credits, nor do they contradict alternative funding models.

Institutions like the Fund could improve their contribution to the safe development of affordable mortgage credits with larger financial exposures, particularly—but not exclusively—DIMs. Also, the fund could extend its current funding role to a more general, supportive, and enabling role.

A modernized central funding (liquidity) institution could undertake the following:

- Develop faster and less bureaucratic procedures.
- Extend its stabilization role in order to reduce liquidity, as well as interest rate and prepayment risks of primary lenders (more mortgage credits increase cash flow risks).
- Propose some funding options exercised upon demand (maintaining open rights for lenders).
- Assume some portion of macro-economic credit risks (final write-off after a certain number of extended years).
- Open its eligibility to more products and indexes for DIMs (encouraging competing innovations, but retaining high-quality standards of security and transparency).
- Purchase existing DIM credits (seeds of a secondary mortgage market, as a centralized refinancing facility could be capitalized by primary banks).

Conditions of a Possible Sale and Securitization of DIM Credits. Another comment should stress the difficulty of securitizing DIM credits, precisely because of their fluctuating cash flows and terms, which is not well understood at present by institutional investors. To some extent, negative amortization may not be a major problem, as stable deflated repayments could nicely meet the expected returns of long-term investors like insurance companies or pension funds, which must also pay some inflation-adjusted cash flows to their clients and members. The problem rather stems from the deflated fluctuations and variable terms generated by DIMs. The issue can be significantly reduced, though never fully eliminated, by taking the following steps:

- Diversify various DIM vintages in securitized pools in order to stabilize flows and improve the resistance of pools to economic shocks (even if each vintage may be subject to individualized underwriting standards and close monitoring).
- Exclusively securitize DIM credits that exceed reasonable payment-to-balance ratios to ensure the final amortization and minimize the possible effects of a variable maturity. For example, for effort ratios over 1.5 percent, the terms of DIMs will hardly vary by more than two years even if the indexes vary widely (*Graph 7*). The impact on average portfolio duration is then reasonable when compared to prepayment effects. Beyond securitization, or more simple portfolio resale techniques, these two previous points could be applied whatever the funding strategy.

Besides specific funding instruments like the Fund or securitization, the two main funding categories are general deposits and capital markets securities (such as mortgage bonds, since Poland has just enacted the Mortgage Banking Law). Universal banks, as opposed to specialized mortgage banks, would mobilize deposits rather than issue bonds. The latter can be authorized to issue privileged mortgage bonds but cannot leverage much of their other types of liabilities (debt, deposits, normal bonds, etc.). Universal banks are expected to mobilize large stocks of deposits during the next years.

Funding of DIMs by Universal Deposit Banks. The average deposit term remains limited, below six months. During a starting-up phase of a growing mortgage portfolio, banks may still find sufficient deposits (sufficiently diversified between depositors as well) and take a very limited transformation risk. Their DIM financial index should preferably reflect the average evolution of deposit rates (only PKO BP has taken this approach, however). Should DIMs capitalize more interest than expected, other banking activities should not be blocked as a result of DIM portfolios consuming an unexpected amount of available liabilities.

The interbanking market looks too volatile, illiquid, and short term to represent an exclusive funding source for DIMs. But it still represents an accessible funding security valve, which could match unexpected flows. Smaller banks are still deprived of this

access (or have too limited an access). Deposit banks should therefore cap their growing DIM portfolio as a given percentage of their current deposit stock in order to keep a reasonable security margin of funding. This ratio could depend on the following:

- The average mismatch of terms between deposits (from historical series) and DIM credits.
- The proportion of stable, rolled-over interests from deposits (a decisive factor to be compared with capitalized interests on DIM portfolios).
- The estimated evolution of DIM balances and cash flows (net of any new production, but including some conservative assumptions of late payments, defaults, and prepayments).
- The historical and expected volumes of new net deposits and DIM production.
- The bank's eligibility for the Fund's capacity to sell its portfolio or to have it externally refunded.¹²

This analysis would correspond to a medium-term cash flow plan dedicated to DIM production. The resultant percentage would determine a consequent maximum transformation ratio. The analysis could be very enlightening for lenders. It could be required, or at least strongly recommended, by supervisory banking authorities (either for their own approval, or at least for the approval of each bank's council). It could represent a starting point for any dialogue between a given bank and NBP.

This approach could compensate for the currently insufficient regulatory tools for liquidity management. A short-term ratio of liquidity is published, but it corresponds to assets and liabilities shorter than three months. Banks also regularly present to NBP the breakdown of their balance sheets according to various final terms (above five years, between two and five years, etc.), whatever the patterns of amortization, payment, and duration.

Funding of DIMs by Specialized Mortgage Banks. The issue of liquidity management could be partially solved by the legislative proposals for mortgage bankers. Mortgage portfolios could essentially be matched by the issued mortgage bonds. Bond holders would be protected: circulating bonds would be matched at any time by a sufficient amount of mortgage credits (presenting a superior amount, interest rates, and terms), which would be transferred directly to investors over any bankruptcy inventory process on the mortgage bank. Marginal subordinated liabilities could be mobilized to complete funding (up to some limited ceiling).

¹² This represents an element of financial security in case of unexpected funding needs.



DIM specifics should not theoretically harm this model. Yet the imposed congruence principle is applied on volume and interest rates rather than on cash flows. In practice, mortgage bonds issued on capital markets may present a flow pattern different from corresponding DIM credits, because of the following bond characteristics:

- A much lower and fixed maturity.
- A capital market base rate, which should be, but may not always be, reflected in DIMs.
- A possible resistance by investors towards interest capitalization (despite the comment above).

The cash flow management may turn out to be a delicate financial exercise. As a consequence, banks may use as many alternative short-term liabilities as legally possible (thereby taking some interest rate risks), and manage a more complex and costly agenda of bond issuance (more frequent issuance but smaller amounts).

The scope of the problem could be consolidated by adopting the following measures:

- A secure standard applied to all DIMs (as presented in this report to minimize risks).
- A pooling of DIMs in mixed packets (more resistant to shocks, more stabilized flows).
- If necessary, a temporary state guarantee on capitalized interests of mortgage bonds (as deferred interests result from inflation, which government policy opposes), through a public institution on a fee or margin basis.

The Treatment of Deferred Interests and the Profitability of Lenders

How should capitalized interests be accounted by lenders? From an accounting perspective, they can either be ignored as income on a cash basis (only paid interests being accounted) or treated on an accrual basis. The resulting balance sheet and gross results will be much improved by using the accrual basis during the next few years (but in the long run, there is not much difference). Provided that DIMs are safely underwritten and supervised, capitalized interest should be accounted on an accrual basis in Poland for the following reasons:

- A cash basis would introduce an asymmetry between borrowers' immediate affordability and lenders' deferred profitability.

- Capitalized interest can be paid later without additional problems under conditions of limited total maturity and stable effort ratios.
- Lenders may have little incentive to make DIM credits; in the face of high entrance costs, they cannot afford to wait for too many years before recording benefits from mortgage activities. A sophisticated financial model has estimated that a three year period might be required for a Polish bank to reach its profitability break-even point (with realistic assumptions for production, productivity, margins, fixed and variable costs, risks, reserves, and losses). The resultant (relative) difference in earnings is considerable for Poland, and represents a strategic issue. This is even more important if universal banks accelerate the buildup of retained earnings from mortgage portfolios to capitalize subsidiary mortgage bank.
- Finally, a cash basis would eliminate the symmetric possibility of capitalizing the interest of mortgage bonds (lower cash flows for investors), which may represent a barrier for such bonds.

Only safe credits should be authorized for treating deferred interests on an accrual basis. For the time being, only the Mortgage Fund has benefited from this privilege, which could be extended to any DIM mortgage credits considered safe, even if not actually refinanced by the Fund. Banks should be required to keep both cash and accrual accounting presentations, even if they only publish one to avoid confusion (likely to be accrual, except for banks whose board and shareholders are driven mostly by long-term considerations). Yet, any imprudent bank (below safe DIM standards) should be asked by NBP to switch back to a cash basis, which provides a strong incentive to meet standards.

If an accrual basis is used for deferred interest, when should it be subject to income tax? As those incomes do not correspond to actual cash flows before being paid, why should the fiscal authorities benefit from an advance cash flow before the lending bank? Tax should be paid as deferred interest is included in gross results (the original basis for net benefits to be distributed or reinvested); then the related income taxes may be due accordingly and immediately.

The answer is a matter of political priority between two possible short-term beneficiaries: banks and other large investors, or the Treasury. The Mortgage Fund gave the lead to banks (cash basis for taxes). To some extent, the question is not vital: even if banks pay taxes on a cash basis, they should still clearly be required to set aside 100 percent reserves for deferred taxes (as currently required by international auditors). Net results, benefits, and dividends would then not be affected. But equity would be improved (such reserves can be treated as Tier equity for capital adequacy two requirements), as would net initial cash flows. This improvement might help to develop



mortgage banks (that is, symmetrical treatment of capitalized interests through long-term mortgage bonds). In contrast, Mexican commercial banks had to pay income taxes on accrued capitalized interests, which worsened their cash flow situation and drove them to launch more “dangerous” DIMs in 1994.

SUMMARY RECOMMENDATIONS FOR DIM DESIGN IN POLAND

A Summary Overview of DIMs:

- If well underwritten, DIMs are one of the most effective, robust, and creative housing finance instruments under unstable economic conditions (changing real rates and incomes).
- DIMs are efficient in a low to moderate inflation context.
- However, DIMs can lead to severe contingent liabilities if improperly underwritten.
- In addition, DIMs are complex products to underwrite, originate, service, and regulate.

Major regulatory issues include the following:

- Various generations of DIMs should be closely watched through their payment-to-balance ratios (which should increase). If they are consistently falling (beyond seasonal effects), corrective measures should be taken (lower margin, incentives for partial prepayments) to enable amortization (meanwhile, impose some special tax-deductible reserves).
- Preferably, home ownership mortgage credit should require 50 percent risk-weighting for solvency purposes.
- An authorized accrual basis for deferred interests is appropriate with safe standards.
- More recent vintages, which are more sensitive to economic shocks than older ones, should be closely watched.
- Funding would require depository banks to periodically limit their long-term mortgage portfolios as a percentage of their current deposit stocks. Financial planning should estimate the evolution of cash flows (from the credit portfolio

and planned production, with prepayments and deferred interests, and the evolution of depositors and rollover deposit interests).

A summary overview of DIM characteristics of greatest concern to both banks and regulators includes the following:

- The expected maturity of DIMs should not exceed 20 years (there is exponential oversensitivity beyond this term).
- The DIM rate (the average difference between deflated indexes) should be conservatively estimated by the lender (at least five percent plus margin, preferably more). A resulting minimum first-payment-to-balance ratio should then be set (at least 0.9 percent in Poland, preferably one percent, above 1.1 percent for a stronger resistance to shocks).
- The resulting maximum affordability represents slightly more than two years of household gross income.
- The underwriting policy should always be revised according to the changing economic background.
- The negative amortization should not be capped.
- Partial indexation options should be limited (and retain a high percentage of indexation).
- Options to cap the extension of maturity should be encouraged (the effect after five or seven years is only marginal).

With regard to DIM Indexes:

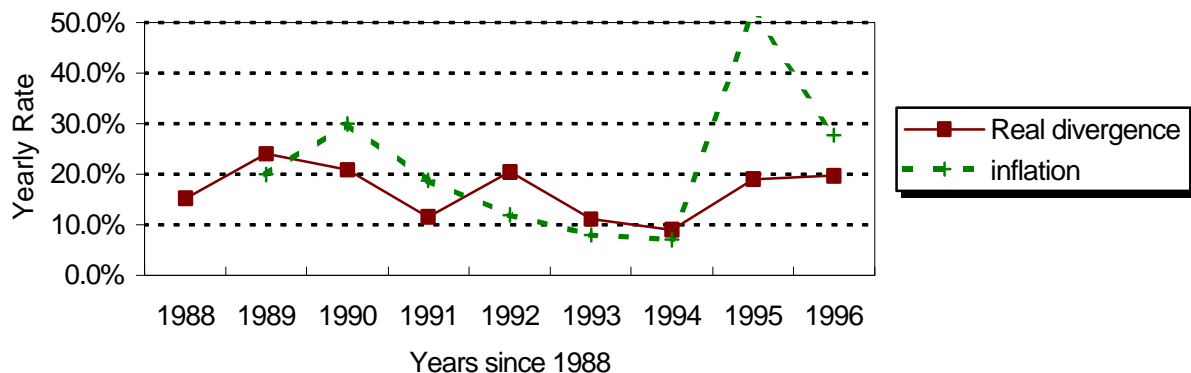
- The financial index must be transparent and nondiscretionary; and it must reflect as closely as possible the variable costs of reliable funds for a given lender in the long run (this differs for each bank). A lender's margin should be added through the credit rate if reasonable (if excessive, it should be separated as fees).
- The income index must reflect the actual evolution of incomes of targeted borrowers (not an abstract administrative index, not an aggressive overestimate, not delayed, not bureaucratically regulated, not too fragmented). A second best index could be CPI minus a security margin (for example, five percent).
- Both indexes should be adjusted frequently if inflation rates are high.



Additional design issues indicate that:

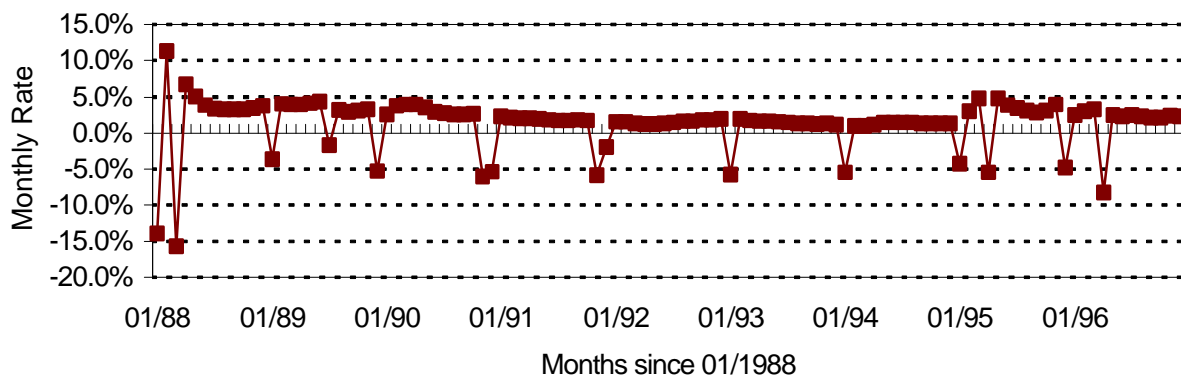
- There should be uniform treatment of capital and deferred interest through balances for loan-loss reserves.
- Moderate loan-to-value ceilings are appropriate (they should be more stringent only if there are legitimate risks of declining deflated housing prices in the short term).
- Income taxes should be paid when cashed (but with deferred-tax reserves).
- Lenders should mix the flows of various vintages in order to stabilize their funding needs.
- The resistance to short-term shocks is quite substantial (even if not infinite).
- More limited resistance to permanent shocks occurs just after origination (an additional four percent drift).
- Centralized funding institutions like the Mortgage Fund should be preserved and modernized, as a stabilizing factor during an expanding transition phase.
- Securitization is difficult but still possible by mixing vintages (better resistance of flows) and keeping larger payment-to-balance ratios (above 1.5 percent).
- Mortgage banks should also defer interest through bonds (with the possible help of a very limited public guarantee under adverse or unexpected conditions).

Graph 13
DIM-divergence yearly rates (Mexico)





Graph 14 (Mexico)
 Monthly DIM-Rates (CPP and Min. Wage)



Graph 15
 Yearly inflation rates in Poland

