MATURITY MISMATCH IN THE POLISH BANKING SYSTEM AND ITS IMPACT ON THE ECONOMY

Błażej Kochański

Abstract

In the article maturity mismatch in the Polish banking system is estimated based on the publicly available data. Then the impact on the economy is discussed.

Based on Polish central bank's data it may be estimated that between 1996 and 2012 the maturity gap increased significantly – average residual maturity of assets exceeds 6 years in 2012 (less than 2 years in 1996), while that of liabilities remains below 1 year. The gap between assets and liabilities is even wider if we take into account the fact that due to legal constraints practically all deposits in Poland are callable.

Growing maturity mismatch in a particular bank may result in higher credit, liquidity, legal, model, interest rate and other risks. Risks accepted by banks may then propagate through the economy, which may lead to financial instability. Increasing gap affects monetary aggregates; additional imbalances catalyze asset bubbles, e.g. a boom in house prices. Also, it could be claimed that maturity mismatch distorts the economic incentives through lowered interest rates. Special case of the maturity mismatch is constituted in Poland by foreign currency denominated mortgages funded with short-term local currency deposits and hedged with short-term swaps.

Key words: maturity mismatch, banks, systemic risk, financial instability

JEL Code: E44, G01, G21

Introduction

Maturity mismatch, the gap between maturities of assets and liabilities is one of the intrinsic features of the modern banking system. Some claim that the maturity mismatch has a benefit of satisfying investors' interim liquidity needs, therefore it needs to be supported by the authorities, e.g. through deposit insurance (Diamond & Dybvig, 1983). Others show that this mismatch (especially demandable debt) helps discipline bank managers (Calomiris & Kahn, 1991). It is often claimed, however, that such gap is one of the crucial fragilities of the

financial system and excessive maturity mismatch was one of the reasons of the financial crises (Viñals et al., 2010). Additionally, Brunnermeier & Oehmke (2013) show that banks and their debt-holders are subject to incentives to shorten liability maturities and thus increase maturity mismatch beyond reasonable levels. Kotlikoff (2010) argues, that government-supported maturity mismatch is not only a serious threat to the economy, but it is simply unsustainable.

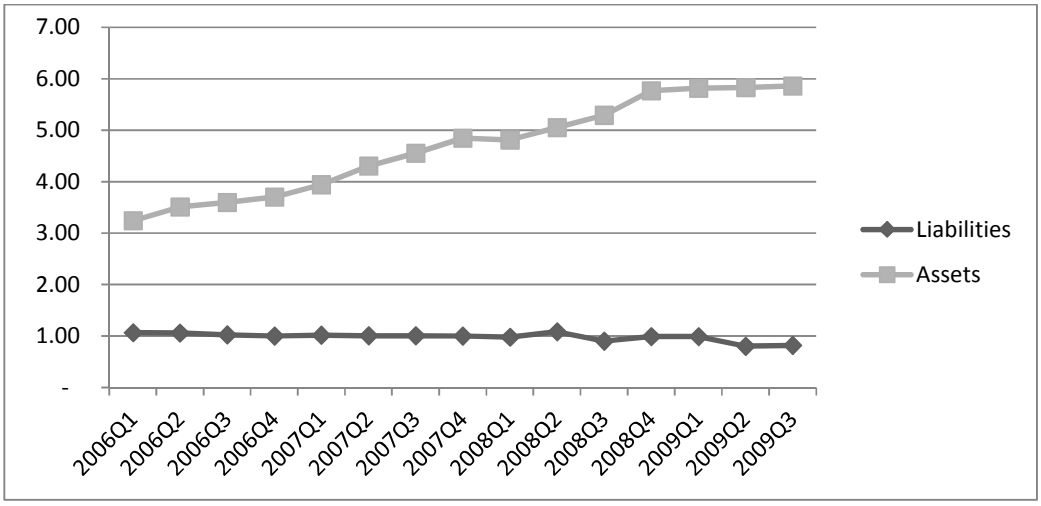
This article contains estimation of growing maturity gap in the Polish banking system and shows various risks arising from this increase. In the first section, estimation of maturity mismatch in Polish banks is presented. It seems that the gap between terms of assets and liabilities has been growing since the beginning of the millennium. Second section contains the discussion of various risks related to growing maturity mismatch both from microeconomic perspective (individual bank's point of view) and from macroeconomic perspective (systemic risk, monetary policy, financial cycles). In the third section, some subject-matter information related to the Polish banking system is presented.

1 Maturity mismatch in Polish banks - estimation

Based on the data published on National Bank of Poland's website it may be stated that maturity mismatch in the Polish banking system is growing. Short-term liabilities are used to finance even longer-term assets. In its Financial Stability Reports published in 2009 National Bank in Poland presented data showing that while average residual maturity of liabilities in the banking system was more or less stable in 2006-2009, the average residual maturity of assets increased significantly in this period from around 3 years to 6 years. The data has been shown on Figure 1.

Unfortunately, NBP ceased to present the data on average residual maturities – no such data are available for the years after 2009. Also, there is no compatible information available from NBP for years before 2005.

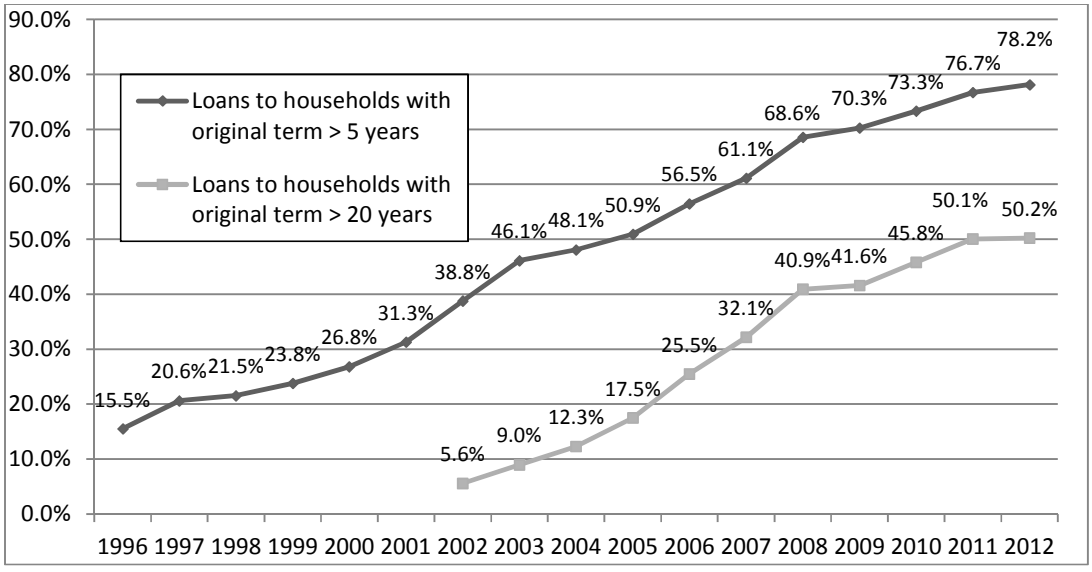
Fig. 1: Average maturity of assets and liabilities at commercial banks (in years)



Source: National Bank of Poland, Financial Stability Reports – June 2009 and December 2009.

Analysis of data on original maturities of loan portfolio shows however that periods for which loans were granted were growing throughout years 1996-2012. Figure 2 presents share of loans with original term exceeding 5 years / 20 years in total loans granted to households in the Polish banking system. It seems that while in 1996 loans with maturities exceeding 5 years constituted only 16% of the total loans to households, in 2012 half of the portfolio exceeded 20 years.

Fig. 2: Share of loans with original maturity exceeding 5 years and 20 years in total loans to households in the Polish banking system (years 1996-2012)



Source: Statistical data from National Bank of Poland's website (www.nbp.pl).

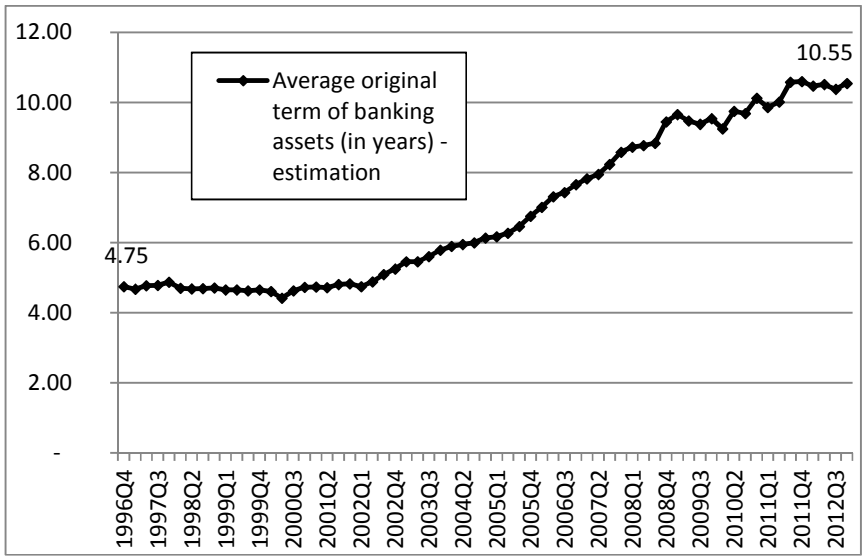
The data on original asset maturities from National Bank of Poland's website can also be used to estimate the average original maturity of assets. Figure 3 shows the result of such estimation. The calculation was performed using following formula:

$$avg\_orig\_maturity_t = \frac{\sum_B A_{Bt} m_B}{\sum_B A_{Bt}} \qquad (1)$$

where A_{Bt} stands for assets in bucket B in time t (ends of quarters were used) and m_B stands for assumed average maturity in bucket B[1].

Long-term residential mortgage loans constituted growing portion of banking assets in the described period – as a result average original maturity increased from around 5 to around 11 years.

Fig. 3: Average original term of assets in the Polish banking system (years 1996-2012)

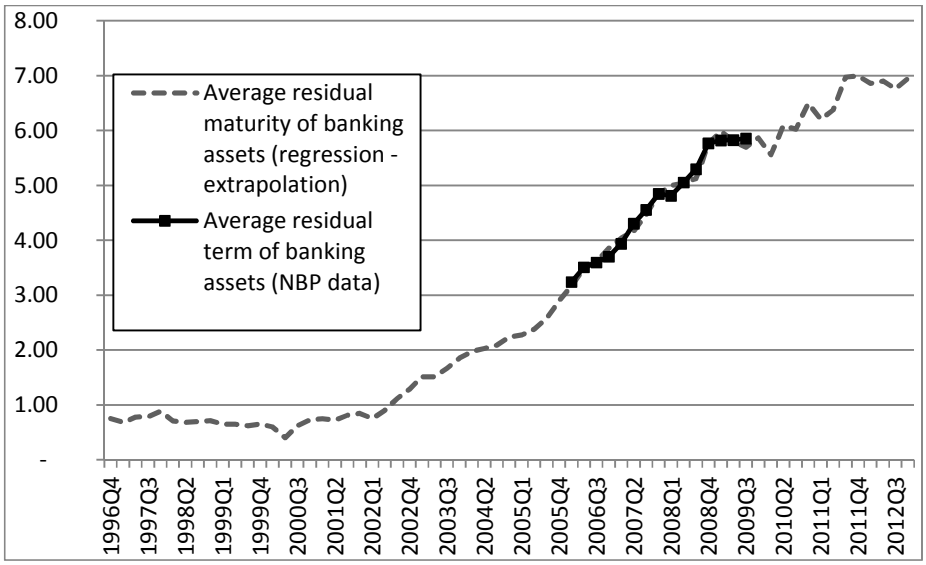


Source: Author's calculations based on statistical data from National Bank of Poland's website (www.nbp.pl).

Data presented on Figure 3 helps to extrapolate residual maturities of Polish banks' assets (NBP data for 2006-2009 presented on Fig 1) for 1996-2005 and 2010-2012. Figure 4 shows the result of a simple extrapolation using linear regression (single input variable being average original term, R^2=98%).

[1] 0.5 year in the bucket with maturities up to 1 year, 3 years for bucket 1-5 years, 7.5 years for bucket 5-10 years, 15 years for bucket 10-20 years and 25 years for bucket with loans exceeding 20 years; additionally 12 years were assumed for loans to households and companies exceeding 5 year.s if further split was not avaiable (data before 2002 did not contain further split) and 7.5 years for other assets exceeding 5 years.

Fig. 4: Average residual term of banking assets – NBP data and regression-based extrapolation (years 1996-2012)



Source: National Bank of Poland, Financial Stability Reports – June 2009 and December 2009 and author's calculations based on statistical data from National Bank of Poland's website (www.nbp.pl).

Such approach to extrapolation may be naive – however, based on the presented data it is obvious that maturity of assets has been growing in most of the period 1996-2012. It would be safe to claim that residual maturity of banking assets increased from 2 or less years to more than 6 years. As maturity of liabilities most likely remained stable (did not increase), significant increase in maturity of assets translated into growing maturity mismatch.

The maturity gap in the Polish banking system is even bigger due to the fact that (a) most of the liabilities in the Polish banking system are deposits (~60% in relation to total assets) and (b) due to regulations and their interpretations all deposits in Poland are callable (maximal „penalty" being loss of accrued interest). As a result, even if a contractual maturity (original and residual) is, say, 1 year, actual „stressed" maturity is 0 days or 1 day – term deposits are practically identical to demand deposits.

2 Micro- and macro-economic consequences of growing maturity mismatch

Widening maturity gap has micro- and macro-economic implications. From a microeconomic point of view, growing maturity mismatch results in increased risks for individual institutions. First of all, liquidity risk could be mentioned in this context. The wider

the gap, the more frequent the need for refinancing or "rollover" of liabilities. Growing maturity mismatch may also result in increased risk of bank runs if callable deposits constitute significant portion of liabilities.

But liquidity risk is not the only risk attributable to the growing gap – example of US Savings and Loan Associations debacle shows that the gap between the term of assets and liabilities results also in interest rate risk. In the case of S&Ls, long-term fixed-interest mortgages were financed with short-term deposits - this induced technical insolvency when interest rates went significantly up in the early eighties (Hellwig, 1995).

Another risk exacerbated by growing maturity gap is credit risk – longer term of assets, especially in the case of closed end amortizing loans, results in longer exposure to changing environment. Even if we assume that we are able to predict economic situation two years ahead with reasonable confidence, predicting 10 years ahead is clearly impossible. For example, employment situation 5 years from now may be very different to what we have in present, resulting in unexpected increases in default frequencies.

There are also other risks influenced by increasing maturity mismatch, e.g. model risk. Model error may translate in greater losses if it affects assets with longer terms. Another case is legal risk. It is not hard to imagine that regulations or interpretations may change during the life of a long-term contract. For example, legal constructions in a standard loan contract designed to enable recovery process may become obsolete, and as a result the bank may suffer losses due to reduced recoveries from defaulted loans.

Microeconomic risks to individual banks, described above, may lead – through direct or indirect contagion, or through correlated sensitivity to structural shocks – to systemic disturbances and crises. Typical example is a bank run which may propagate through indirect channels to the entire system (Diamond & Dybvig, 1983). Another example of systemic crisis – driven by structural shock – is US S&L crisis in the eighties, mentioned before.

It is often claimed that "excessive" maturity mismatch was the source of the recent financial crisis. For example, a report of International Monetary Fund states: "*Liquidity risk was also higher than recognized. Financial firms and key markets relied increasingly on short-term, wholesale funding and took on excessive maturity mismatches while failing to build adequate liquid asset buffers*" (Viñals et al., 2010). It is also stated that contrary to runs known from previous crises, in this case liquidity problems were driven mainly not by demand deposits, but by repo transactions (Hellwig, 2009). Others add that maturity mismatch got out of control because of the shadow banking system, where this gap was widening without supervisory control and "safety net" (Ricks, 2010).

Increased possibility of systemic crises is one of the major macroeconomic consequences of the described phenomenon. There are also other possible developments driven by the growing maturity mismatch which could be mentioned in this paper.

In the opinion of the author, increased maturity mismatch enables amplified money creation. Much more credit is generated in the economy when 20- or 30-year mortgage loans become possible, compared to the situation when standard loan term does not exceed, say, 10 years (the crucial factor here is credit affordability: 30-year loan enables higher mortgage approval rates and higher loan amounts). That's why maturity mismatches should be also looked at from the monetary policy point of view.

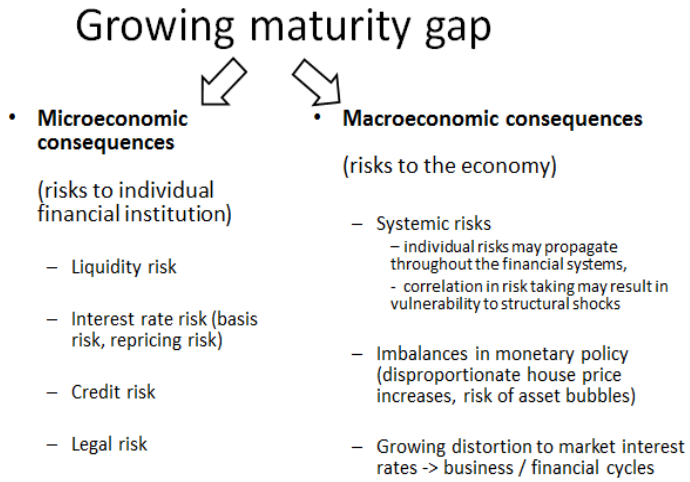
Growing maturity mismatch in case of Poland was driven mainly by longer maturities of loans to households – mostly residential mortgages. In other banking systems longer term illiquid projects may include corporate loans, for example construction loans. From monetary perspective increased possibility of credit creation may result in increase in prices. Longer term loans usually finance specific types of assets, therefore the obvious risk is that of incommensurate increase in asset prices, for example inflation of or bubble in house prices. Implications of maturity mismatch to monetary policy are rarely discussed, which is surprising bearing in mind that maturity mismatch may be equally powerful driver of credit creation and monetary aggregates than some of standard monetary policy tools – obligatory reserve rates or interest rates. The problem becomes even more vital if banking supervisory body is not integrated with a central bank – in such a case risk of lack of coordination in this aspect is evident.

We can go even further discussing macroeconomic risks of growing maturity gap. Some economists claim that maturity mismatches in the banking system result in distortions in market interest rates and constitute one of the major causes of business cycles. According to Jesus Huerta de Soto (2009), demand deposits brought to existence through bank money creation ("fractional reserve") are not real savings and as such lead to artificial reduction of interest rates. As a result economic actors decide to engage in wrong, unsustainable, projects. This, in turn, results in a business cycle. According to Philipp Bagus (2010), such mechanism may occur even in the absence of "fractional reserve system" (demand deposits used to finance long-term projects) – other forms of maturity mismatch (eg. borrowing short through repo transactions or commercial papers to lend long) have similar consequences, especially when supported by central bank. Both authors are members of so called "Austrian School of Economics". Similar, although not identical, idea of the cycles driven by the financial system

have been mentioned also outside of Austrian School of Economics. For example Borio (2012) mentions a concept of financial cycles driven by credit booms and credit crunches.

Micro- and macro-economic discussions on ramifications of growing maturity gap should continue, as it could be expected that the Polish banking system is not the only system where such increase took place. Figure 5. summarizes micro- and macro-economic consequences of the growing maturity gap mentioned in this paper.

Fig. 5: Micro- and macro-economic consequences of the growing maturity gap



Source: Prepared by the author.

3 Maturity mismatch in Polish banks – its role before and in the financial crisis

Theoretical discussion on the consequences of a growing maturity mismatch presented in the previous section can be supplemented with some insights into specific situation of the Polish banking system. Polish banks increased their risk when they widened the term gap between their assets and liabilities. In some cases this increase in risk manifested itself during the crisis.

For example deposit rollover risk resulted in increased liquidity tensions when the financial crisis started to influence Polish financial market. The transmission of the liquidity tensions went through at least three channels. First, financing gap in the Polish banking system (surplus of loans to customers over deposits from customers) was closed by foreign lending, mostly from mother companies of the banks. When liquidity tensions occurred, it was probably much more challenging to obtain the new funding or renew existing one on

similar terms – customer deposits became an attractive alternative. Second channel is constituted by indirect contagion. When information on the liquidity problems of European and US banks started to emerge, Polish customers (both households and corporates) started to worry about security of their funds on bank accounts. According to National Bank of Poland's information on payment systems, at the height of the tensions, in October 2008, daily increases in cash in circulation reached the level of even 1-2 billion Polish zloty (approx. 0.2-0.5 bln euro), many times more than the levels known from past. Third channel, being a consequence of financing strategy for foreign currency loans is discussed below.

As a result of those three channels, customer deposit rates went up significantly (so called "deposit war"). Apart from liquidity risk, specific kind of interest rate risk (analogical to that of US S&Ls) manifested itself. As assets income of Polish banks is based, to great extent, on interbank market rates (used as a reference in contracts) and deposit interest income depends on rates on the customer deposit market, problems emerge if those two types of interest rates start to diverge. Before the crisis those two types of interest rates were highly correlated (Pearson's r exceeding 0.9), after 2008 the correlation seems to be low (~0.2)

When discussing maturity mismatch specifically in the Polish banking system, additional dimension should be taken into account: currency mismatch related to foreign-currency lending. Currency mismatch of that kind brings additional risks: long-term assets denominated in foreign currencies (euro and Swiss franc being the most popular) are financed through the mixture of at least three components: Polish zloty deposits aided by off-balance sheet derivative instruments, bonds issued in foreign currencies and financing from mother companies.

In all above cases maturity mismatch occurs, but in the case of financing with Polish złoty deposits the mismatch seems to be most fateful. When foreign currency loans are financed through short-term Polish złoty deposits a bank reduces its currency risk using swaps (either shorter-term FX-swaps, or longer term cross currency interest rate swaps). Those swaps are also short- or medium-term: FX-swaps have usually maturity of several months, CCIRS transactions are longer – up to several years. As a result there is a triple mismatch: long term loans, short-term deposits and short/medium-term swaps. Rollover risk is affecting not only deposits, but also swaps. Sudden change in the foreign exchange rate may cause additional cash needs to cover swap settlement. It seems that swap rollover needs were an additional important driver of a sudden increase in customer deposit rates ("deposit war") in 2008/2009.

In the crisis, discussion on maturity mismatch in Poland was shaped by Basel 3 proposals. Polish Financial Supervisory Authority started discussions on popularization of bond issuing as a tool to close the gap identified by simulations of Basel's NSFR measure. It is interesting to note that the regulators were not interested in enabling non-callable deposits which could constitute a more successful tool enabling longer-term liabilities.

Finally, mismatch-related money creation and asset-bubble risk requires a few remarks. Residential mortgage loans to individuals were to greatest extent behind the growing maturity mismatch in Poland; this created pressure on house prices. There is no standardized house price index available for Poland that could be used to show a longer series of changes in real estate values. Available data indicate that there was disproportionate increase in house prices in Poland in the period when the maturity gap was widening (as shown in Fig 1-4). For example, Eurostat estimations show that in 2005-2008 nominal house prices went up by more than 100%[2]. This once again underlines importance of the analysis of money creation driven by maturity mismatch.

Conclusion

Increased attention to the risks associated with maturity mismatch is definitely needed, both from academia and policy makers. Growth in the gap presented in the first section is quite significant – the term structure of Polish banking system is entirely different to what it looked like just 10 years ago. A number of risks related to the increase of the maturity mismatch, both micro- and macroeconomic have been mentioned in the article. It is quite probable there are also several other aspects of this situation, not enumerated here. It would also be interesting to see if similar change took place in other banking systems.

If excessive maturity mismatch is dangerous to the economy, adequate regulatory policy should be considered. It is not clear how to address the problem of limiting maturity mismatch unless radical reform proposals are accepted. Such reforms would include banning "fractional reserves" – Huerta de Soto's (2009) proposal is one of them, another is "limited purpose banking" by Kotlikoff (2010). If maturity mismatch needs to be limited, not eliminated altogether, there is no certainty as to appropriate policy actions. One thing is that it is not clear when maturity mismatch starts to be "excessive", another is that system limiting maturity mismatch in particular institutions would easily be avoided by maturity cascades as

[2] SB_A_NOMHOUSE variable within „Alert Mechanism Framework"
ec.europa.eu/economy_finance/indicators/economic_reforms/api/data.cfm?application_name=mip&timeSeries=&group=SBA&country=&year=&format=excel&FC=1&L=1&LY=1&x=0&v=L

described by Hellwig (1995). It is also interesting to note that Basel's NSFR measure which is aimed at reduction of structural liquidity imbalances has a perspective of 1 year, and does not differentiate longer terms – residual maturity of 2 years is not differentiated from 20-year maturity in this framework. It is not clear whether this is a correct approach. Those and other questions related to maturity mismatch still need to be answered.

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Contact

Błażej Kochański
Gdansk University of Technology
Wydział Zarządzania i Ekonomii Politechniki Gdańskiej
ul. G. Narutowicza 11/12
80-233 Gdańsk
bkochanski@zie.pg.gda.pl