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Start Analyzing
Your Future!



Kwarta

October 5, 2025



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Aleksander
Kluska
Backend



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Karol Marszałek
Data models,
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Frontend



Aleksander
Kluska
Backend



Karol Marszałek
Data models,
Backend



Andrzej Legutko
Machine learning,
data models



The state of pension calculators in 2025

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What's next?

- Publicly available tools ask users for a long list of input parameters



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What's next?

- Publicly available tools ask users for a long list of input parameters
- Many people simply don't know how to estimate those inputs realistically



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What's next?

- Publicly available tools ask users for a long list of input parameters
- Many people simply don't know how to estimate those inputs realistically
- As a result, outputs are highly uncertain — or people just give up and don't use the tool at all



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Wybór wersji kalkulatora - nowe zasady

Kalkulator emerytalny oblicza **prognozowane wysokości emerytur**, które przyznamy po raz pierwszy, wypłacane z Funduszu Ubezpieczeń Społecznych.

Uwaga!

Obliczania w kalkulatorze emerytalnym to prognoza a nie faktyczna emerytura (przeczytaj szczegółowe wyjaśnienia). Prognozowana kwota emerytury, którą obliczysz przy pomocy kalkulatora, nie może być podstawą do jakichkolwiek roszczeń.

Gdy wprowadzasz dane do kalkulatora emerytalnego wykorzystaj informacje o stanie konta, które otrzymałeś od nas. Jeśli masz profil na PUE ZUS, informacje te pobierz z PUE ZUS lub skorzystaj z kalkulatora na PUE ZUS.

Jeśli jesteś członkiem otwartego funduszu emerytalnego, dodatkowo wykorzystaj informację o stanie środków zgromadzonych w otwartym funduszu emerytalnym, którą otrzymałeś z Otwartego Funduszu Emerytalnego do którego należysz.

Kalkulator emerytalny umożliwia wybór wieku przejścia na emeryturę od 60 lat dla kobiet i od 65 lat dla mężczyzn.

Kalkulator oblicza prognozowaną wysokość emerytury na przyszły rok i kolejne lata. Dlatego, jeśli w tym roku osiągasz wiek emerytalny i chcesz poznać prognozowaną wysokość Twojej emerytury, przyjdź do naszej placówki i skorzystaj z usługi doradcy emerytalnego. Doradca emerytalny wyliczy prognozowaną wysokość emerytury na bieżący rok kalendarzowy i wyjaśni od czego zależy wysokość emerytury. Możesz również w tej sprawie zadzwonić do Centrum Kontaktu Klientów pod numer 22 560 16 00 (koszt połączenia wg umowy klienta z operatorem telekomunikacyjnym) lub umówić się na e-wizyte.

Kalkulator daje Ci możliwość wyboru – możesz przeprowadzić obliczenia w wersji uproszczonej lub zaawansowanej.



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Kalkulator daje Ci możliwość wyboru – możesz przeprowadzić obliczenia w wersji uproszczonej lub zaawansowanej.

wersja uproszczona

W wersji uproszczonej masz mniejszą swobodę wyboru i podajesz mniejszą liczbę parametrów. W tej wersji Twoje wynagrodzenie (wyrażone w procencie przeciętnego wynagrodzenia w gospodarce narodowej) od teraz do momentu przejścia na emeryturę, nie zmienia się.

wersja zaawansowana

W wersji zaawansowanej kalkulatora masz większą swobodę wyboru, ale musisz podać większą liczbę parametrów niezbędnych do tego, by wyliczyć prognozowaną wysokość emerytury. Możesz podać różne wynagrodzenia (wyrażone w procencie przeciętnego wynagrodzenia w gospodarce narodowej) w poszczególnych latach. Możesz także – poprzez wpisanie w pewnych latach wynagrodzenia równego zero – wyłączyć te lata z okresu ubezpieczenia.

WYBIERZ



Kalkulator emerytalny wyliczy Ci prognozowaną wysokość emerytury z Funduszu Ubezpieczeń Społecznych według tzw. nowych zasad, na ogólnych zasadach, o których mowa w przepisach¹, łącznie z ewentualną kwotą okresowej emerytury kapitałowej. Prognozowaną wysokość emerytury wyliczamy przez podzielenie podstawy obliczenia emerytury przez średnie dalsze trwanie życia dla osób w wieku równym wiekowi przejścia na emeryturę. Podstawa obliczenia nowej emerytury to:

- kwota zwaloryzowanych składek na ubezpieczenie emerytalne, które są zapisane na Twoim koncie w ZUS,
- kwota zwaloryzowanego kapitału początkowego,
- kwota środków zapisanych na Twoim subkoncie w ZUS.

[Kliknij, aby dowiedzieć się więcej o nowych zasadach obliczenia emerytury](#)



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Emerytura na nowych zasadach uproszczona

Ostatnia Informacja o stanie konta w ZUS za rok:



Płeć:



Miesiąc i rok urodzenia:



Kwota zwaloryzowanych składek:

zł



Kwota zwaloryzowanego kapitału początkowego:

zł



Zwaloryzowana kwota ogółem na subkoncie:

zł



Kwota składek za 12 miesięcy kalendarzowych:

zł



Deklarowany wiek przejścia na emeryturę w latach i
miesiącach:

lat

mies.



Rok rozpoczęcia / wznowienia pracy:



Miesięczne obecne wynagrodzenie brutto:

zł



Twoje obecne miesięczne wynagrodzenie stanowi 0% przeciętnego wynagrodzenia.



Which problems are we solving?

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A tangle of unfamiliar concepts:



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- you don't know where to start



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A tangle of unfamiliar concepts:

- you don't know where to start
- explanations are *ignotum per ignotum* (the unknown explained by another unknown), often circular



Which problems are we solving?

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A tangle of unfamiliar concepts:

- you don't know where to start
- explanations are *ignotum per ignotum* (the unknown explained by another unknown), often circular
- every individual case is different — there is no single template or universal formula



Selected technologies and data analysis methods

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What's next?

We use modern tools that let us address each of these challenges!



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We use modern tools that let us address each of these challenges!

- Historical data (inflation, GDP growth, sector wages) used as a reference context.



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What's next?

We use modern tools that let us address each of these challenges!

- Historical data (inflation, GDP growth, sector wages) used as a reference context.
- Machine-learning models that classify occupation/industry and estimate the earnings trajectory.



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What's next?

We use modern tools that let us address each of these challenges!

- Historical data (inflation, GDP growth, sector wages) used as a reference context.
- Machine-learning models that classify occupation/industry and estimate the earnings trajectory.
- Large language models (LLMs) with RAG — verifying market rates and the freshness of data.

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What's next?

We built a simple empirical mathematical model that captures the saturating nature of nominal wage growth with professional experience (driven by raises, promotions, etc.):



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$$k(x) = 1 + \alpha(1 - e^{-\beta x}) \quad (1)$$



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x — years of professional experience



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x — years of professional experience
salary



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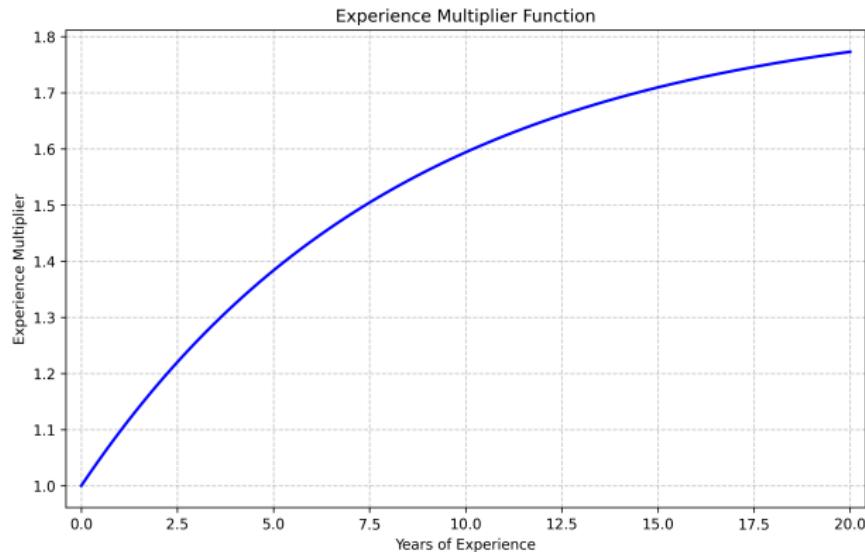
x — years of professional experience
salary = junior salary



We built a simple empirical mathematical model that captures the saturating nature of nominal wage growth with professional experience (driven by raises, promotions, etc.):

$$k(x) = 1 + \alpha(1 - e^{-\beta x}) \quad (1)$$

x — years of professional experience
salary = junior salary $\cdot k(x)$





Regressions for real-world data

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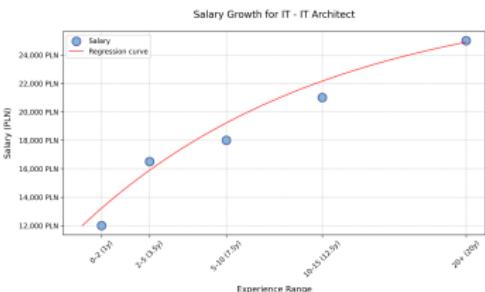
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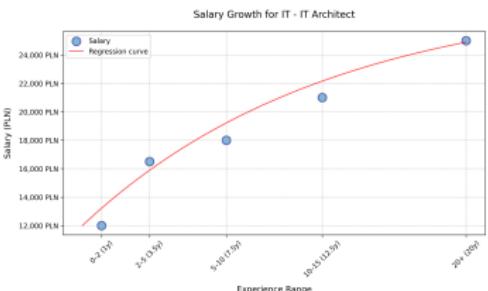
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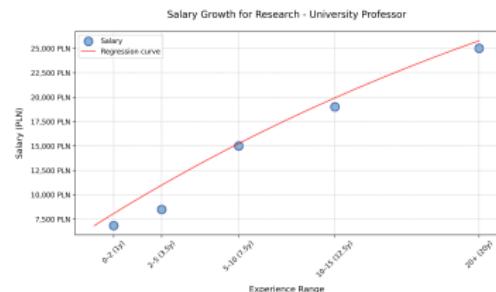
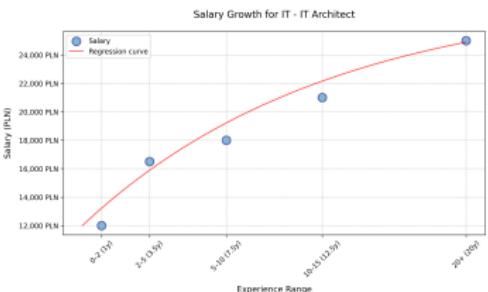
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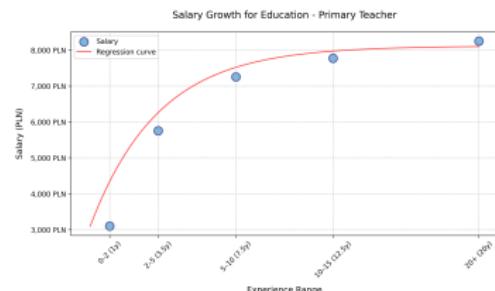
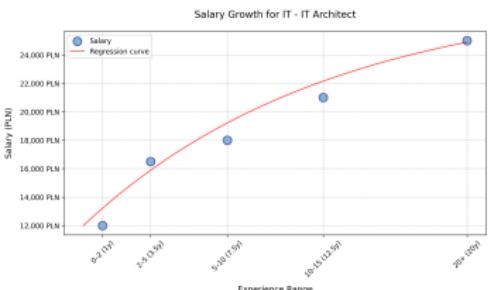
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What's next?

Using the Gemini API, we can assign any occupation to one of our pre-trained models.



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Using the Gemini API, we can assign any occupation to one of our pre-trained models.

With Retrieval-Augmented Generation (RAG) we retrieve the current starting (junior) market rate for the given industry

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Using the Gemini API, we can assign any occupation to one of our pre-trained models.

With Retrieval-Augmented Generation (RAG) we retrieve the current starting (junior) market rate for the given industry

By adding a model of macroeconomic factors such as inflation and GDP growth, we can credibly estimate the user's entire financial history — both past and future!



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Kalkulator emerytury

Wartość pieniądza

Emerytura

Wpisz podstawowe dane aby przeanalizować Twoją przyszłość

Wypełnij formularz. Wartości procentowe podawaj jako % (np. 6 oznacza 6%).

Płeć *	Wiek startu kariery *
Kobieta	20
Stanowisko (industry) *	Wiek *
Programista	30
Miasto *	Pensja netto (PLN/mies.) *
Szpikowice	12000
Wydatki miesięczne (PLN) *	Oszczędności (PLN) *
4000	20000
Procent oszczędności (% z pensji) *	Przewidziana stopa zwrotu z inwestycji (% rocznie) *
20	6
Planowany wiek przejęcia na emeryturę *	Lata doświadczenia na obecnym stanowisku *
65	5

Wyczystić dane **Przejdz do analizy**

Dane pozwolą Ci tylko w tej sekcji przeglądać.



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What's next?

With a minimal set of inputs from the user:

- occupation/industry,



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What's next?

With a minimal set of inputs from the user:

- occupation/industry,
- place of residence,



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What's next?

With a minimal set of inputs from the user:

- occupation/industry,
- place of residence,
- age,



With a minimal set of inputs from the user:

- occupation/industry,
- place of residence,
- age,

our system immediately builds a first-pass financial model:

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What's next?

With a minimal set of inputs from the user:

- occupation/industry,
- place of residence,
- age,

our system immediately builds a first-pass financial model:

- an earnings projection (in nominal and real terms),



With a minimal set of inputs from the user:

- occupation/industry,
- place of residence,
- age,

our system immediately builds a first-pass financial model:

- an earnings projection (in nominal and real terms),
- monthly expenses and savings, years of experience, retirement age — all values can be refined manually at any time.



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Finansowy Kompass

- Kalkulator emerytury
- Wartość pieniężna
- Emerytura

Jaką chcesz mieć emeryturę?
Podaj oczekiwany kwotę. Porównamy ją z obecną średnią wysokością świadczenia.

Oczekiwana emerytura [PLN/mies.] 5000	Obecna średnia 3720 zł	Różnica do średniej +1280 zł
--	----------------------------------	--

Czy wiesz, że przerwy w karierze (np. bezrobocie) mogą obniżyć przyszłe świadczenie przez brak skledelek?

Liczuj ciekawostkę

Umowa a wysokość emerytury
Porównaj, jak zmienia się szacowana emerytura przy różnym rodzaju umowy oraz poziomie aktywności zawodowej.

ABY OTRZYMAĆ EMERYTURĘ 5000 zł Przy aktywności ok. 100% i stały 45 lat	UMF 13 889 zł BRUTTO: 19 295 zł	NETTO 37 037 zł Brutto: 46 296 zł
--	--	--

Stosunki będące na ujemnym zakresie (zdjęcie składek w pensji i stres wyplaty). Kwoty podlegają zmianie.

Średnie miesięczne zarobki [PLN] **Aktywność zawodowa (średnio % stanu)** **Liczba lat pracy**

Wiek	UMF [PLN]	Zlecenie B2B [PLN]	Netto [PLN]
0 lat	0	0	0
5 lat	489	365	960
10 lat	960	645	1444
15 lat	1444	930	2033
20 lat	1929	1230	2400
25 lat	2400	1630	2890
30 lat	2890	2030	3390
35 lat	3390	2430	3840
40 lat	3840	2830	4320
45 lat	4320	3230	4800

Emerytury ponad minimalne: Świadczeniodobiorcy otrzymają emerytury w wysokości ponad minimalnej wykazanej się risku aktywności zawodowej – nie przekraczając minimum 25 lat (mężczyźni) i 20 lat (kobiety), w związku z tym nie mały prawa do gwarancji minimalnej emerytury.



A dynamic chart illustrating the relationship between a planned nominal pension and employment history:

- average earnings,
- length of work experience,
- employment fraction (full-time, part-time, etc.)

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What's next?

The module also compares the pension of a person employed under an employment contract with that of a sole proprietor (B2B), assuming the minimal legally required ZUS contribution.



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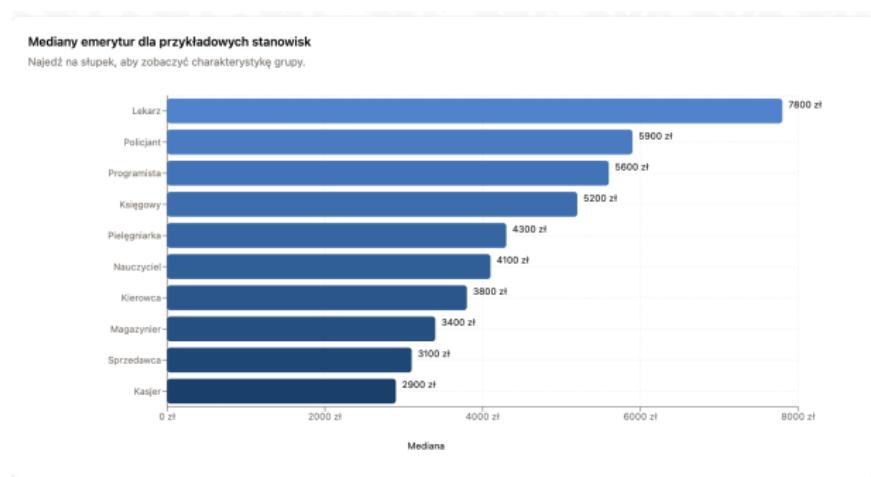
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What's next?

Additionally: a chart presenting the median pension for ten occupations randomly selected at page load.





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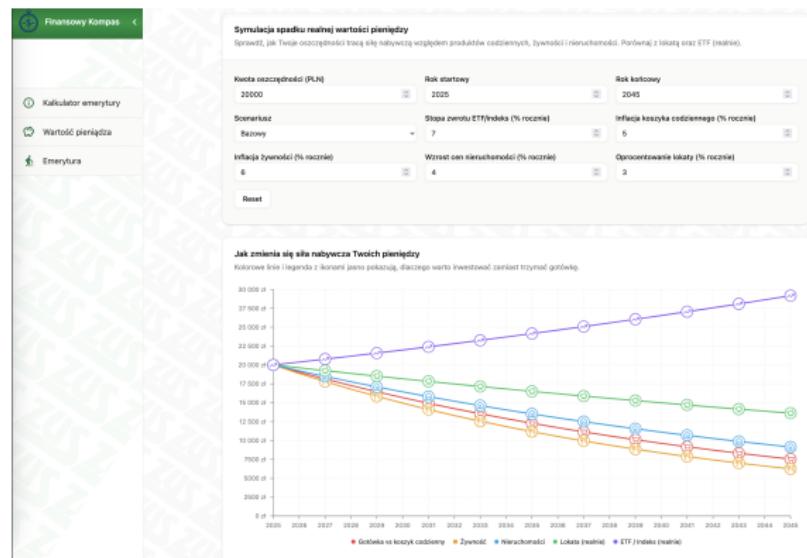
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What's next?

The goal of the “Value Of Money” module is to make inflation tangible.

With configurable scenarios the user can observe on a chart how the value of savings kept in a savings' account or term deposit evolves.



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Summary

What's next?

The goal of the “Value Of Money” module is to make inflation tangible.

With configurable scenarios the user can observe on a chart how the value of savings kept in a savings' account or term deposit evolves. For comparison, we also include: rising prices of food and real estate, and data for global equities (a diversified ETF).



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Summary

What's next?

The goal of the “Value Of Money” module is to make inflation tangible.

With configurable scenarios the user can observe on a chart how the value of savings kept in a savings' account or term deposit evolves. For comparison, we also include: rising prices of food and real estate, and data for global equities (a diversified ETF).

For comparison the chart also includes data on rising prices of essential material goods: food, real estate, and example data for global equities in the form of a diversified ETF.



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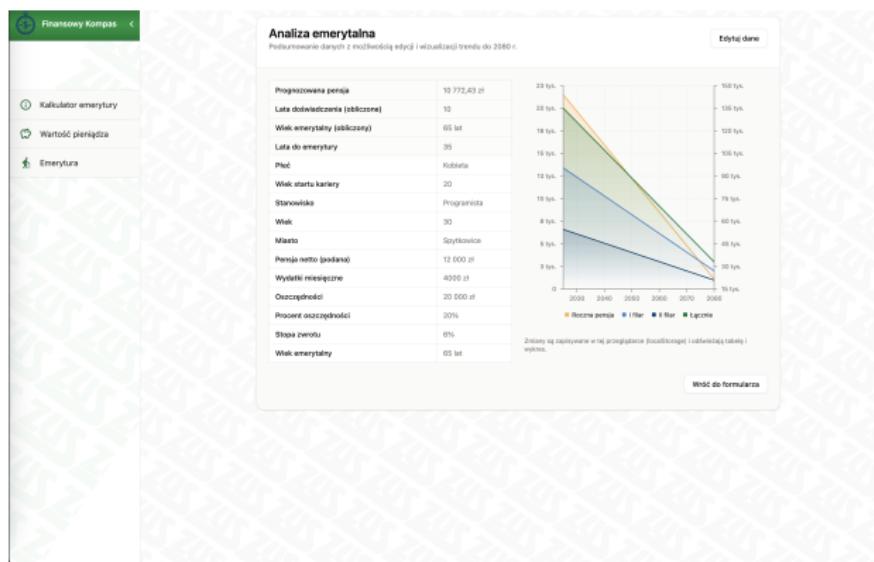
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What's next?

We use the full set of user data (entered manually or inferred from models and defaults) and illustrate the key parameters:



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What's next?

We use the full set of user data (entered manually or inferred from models and defaults) and illustrate the key parameters:

- funds accumulated in the ZUS account and sub-account until the end of working life,

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Summary

What's next?

We use the full set of user data (entered manually or inferred from models and defaults) and illustrate the key parameters:

- funds accumulated in the ZUS account and sub-account until the end of working life,
- earnings trajectory, forecast pension value and the replacement rate — the real, percentage change in income at the moment of retirement.



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What's next?

Unlike Module II, Module IV not only uses the full set of user data (entered manually or computed from our models and sensible defaults) but also illustrates all important pension parameters:

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Unlike Module II, Module IV not only uses the full set of user data (entered manually or computed from our models and sensible defaults) but also illustrates all important pension parameters:

- a chart showing money accumulated in the ZUS account and sub-account over the remaining working years

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Unlike Module II, Module IV not only uses the full set of user data (entered manually or computed from our models and sensible defaults) but also illustrates all important pension parameters:

- a chart showing money accumulated in the ZUS account and sub-account over the remaining working years
- earnings progression, pension levels and the so-called replacement rate — the real percentage change in income the user will experience at retirement.



Module V

Random Events Simulation

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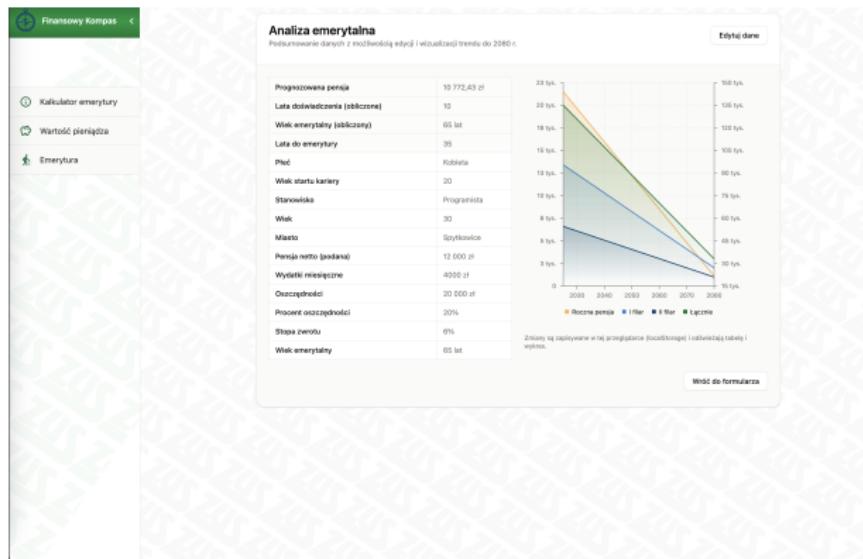
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What's next?

An optional module that factors random events (job loss, illness, parental leave, etc.) into the calculations of Module IV. It helps users understand how strongly early breaks in employment and contributions can affect the final pension amount.



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Summary

What's next?

Our model transforms a simple pension contributions calculator into an intelligent guide to financial dependencies that proactively suggests credible default values for key parameters.



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Summary

What's next?

Our model transforms a simple pension contributions calculator into an intelligent guide to financial dependencies that proactively suggests credible default values for key parameters.

Collecting these data by hand would be time-consuming for the user and error-prone.



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What's next?

→ **The current solution (MVP) demonstrates the usefulness of credible defaults.**



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Summary

What's next?

→ The current solution (MVP) demonstrates the usefulness of credible defaults.

- Evolve into a fully featured application: gradually expand the set of user-editable parameters. Ultimately, every parameter will be adjustable manually for more realistic forecasts.



→ **The current solution (MVP) demonstrates the usefulness of credible defaults.**

- Evolve into a fully featured application: gradually expand the set of user-editable parameters. Ultimately, every parameter will be adjustable manually for more realistic forecasts.
- Improve models and the breadth and quality of data (public and industry sources), leading to higher accuracy and auditable results.

Thank you for your attention!!

Team Kwarta

